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FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES

FIT PROJECT

TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY CONTRACT NO. 68-01-6056

REMEDIAL ACTION MASTER PLAN

Holden Landfill Site

Holden, Massachusetts

FINAL REPORT

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TDD No. F1-8209-03

Prepared by: Ecology and Environment, Inc.
Field Investigation Team (FIT)
Region 1

Submitted to: John Hackler

ecology and environment, inc.

International Specialists in the Environmental Sciences

Contributors

Ecology and Environment, Inc.
Region 1 Field Investigation Team

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The following Region 1 Field Investigation Team members made major contributions to this study in the capacities noted:

Project Manager	-	Christopher Hagger
Environmental Engineer	-	Keith Brown
Civil Engineer	-	Polly Whitmore

TABLE OF CONTENTS

Table of Contents - continued

Table of Contents - continued

FIGURES

TABLES

REMEDIAL ACTION MASTER PLAN

HOLDEN LANDFILL

EXECUTIVE SUMMARY

Statement of Problem

The Holden Landfill Site, located in Holden, Massachusetts, ~~is listed on the U.S. Environmental Protection Agency's Superfund priority list~~.

The 15-acre landfill site, purchased by the Town of Holden in 1959 and previously used for sand and gravel mining, has received municipal refuse and some industrial wastes. However, no data are available which specifically characterize these wastes. Repeated sampling and data analysis by EPA and E&E have determined the major areas of contamination to be the surface waters north of the site, the Quinapoxet River north of the landfill and the groundwater located in monitoring wells north of the landfill. Volatile organics, specifically 1,1,1-trichloroethane, 1,1-dichlorethane, tolune, benzene, dioxane, xylenes, 1,2-trans-dichloroethylene, ethylbenzene, and vinyl chloride have been detected in the surface waters and/or the groundwater monitoring wells.

Groundwater and surface waters north of the landfill flow toward the Quinapoxet River which is a main tributary to the Wachusett Reservoir located less than 1.5 miles downstream from the site along the Quinapoxet River. The Wachusett Reservoir is part of the Metropolitan District Commission's System which supplies drinking water to approximately 2,000,000 people in the Metropolitan Boston area.

Available data do not indicate an immediate threat to the Wachusett Reservoir; however, continued monitoring and the development of a long-term solution to the surface water discharge into the Quinapoxet River problem are needed.

Purpose of Remedial Action Master Plan

The purpose of this Remedial Action Master Plan (RAMP) is to identify and develop the type, scope, and sequence of remedial actions necessary to prevent or mitigate the migration of a release of hazardous substance(s) at the Holden Landfill site. The RAMP will discuss remedial site investigations necessary for remedial alternative evaluation. Remedial action feasibility studies which lead to final on- and off-site remedial action implementation, are also discussed. A remedial investigation work plan, schedule and cost estimates for remedial planning activities have been developed to evaluate and select the most cost-effective alternative source control and off-site remedial actions.

It is anticipated that the final version of this RAMP incorporating U. S. EPA and State comments will serve as the primary planning document for selection and implementation of all necessary remedial activites at the site.

General Approach

The RAMP for the Holden Landfill site, prepared from existing information and analytical data, consists of five basic components; project coordination, community relations plan and, initial, source control, and off-site remedial actions. Initial remedial actions are identified and implemented as soon as possible to mitigate any immediate health and hazard concerns. Source control and off-site remedial actions include the planning of remedial investigations, remedial alternatives development, feasibility, design and implementation of provisions to control hazards identified during this process. Long-term monitoring provides quality control for all implemented remedial actions. The general approach for remedial action planning is presented in Figure A.

Initial Remedial Actions

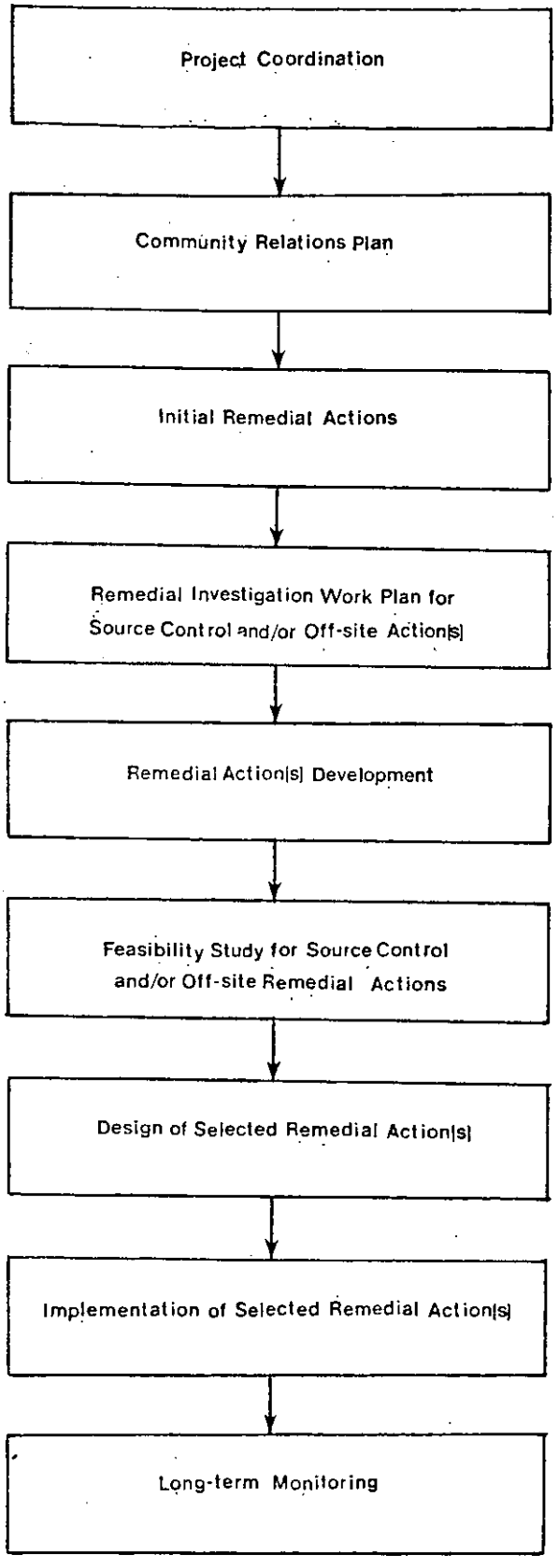
The purposes of initial remedial actions are to limit exposure or threat of exposure of an immediate health or environmental hazard as soon as possible. These actions are performed separately from the remainder of the Remedial Action Master Plan (RAMP) tasks, are limited in scope, require a minimum of planning,and should be consistent with any final remedial action measures.

The initial remedial measures for the Holden Landfill site are discussed in Section 2.4 and are listed as follows:

1. Sampling/analysis of privately-owned wells on Malden Street in Holden and Town wells in West Boylston in order to evaluate all public and private water supply systems potentially impacted within a three-mile radius of the site.
2. Installation of fence and warning signs for off-site area of contaminated surface water drainage in order to provide security and limit access.

FIGURE A

APPROACH FOR REMEDIAL ACTION PLANNING



Source Control Remedial Actions

Source Control Actions are considered when hazardous substances migrate and are not contained within the original disposal area. Source Control Actions have been identified and evaluated with respect to the Holden Landfill's waste disposal practices. In the past, domestic and industrial wastes were disposed of at the Holden Landfill in a manner which has not prevented contamination from leaving the site.

A preliminary list of remedial action alternatives for source(s) of contamination at the Holden Landfill site follows:

1. No action.
2. Interception/treatment of contaminated groundwater.
3. In-situ encapsulation of contaminant source(s).
4. Removal of contaminated source(s) followed by secure disposal.
5. Combination of the above actions.

These Source Control Actions are discussed in more detail in Section 2.5. However, full evaluation of all source control remedial actions cannot be undertaken until more data are gathered on site as discussed in Section 2.5. A feasibility study must then be performed before final selection and design/implementation of the source control actions(s).

Off-Site Remedial Actions

Additional measures, as discussed in more detail in Section 2.6, may be required to mitigate impacts of those wastes already off-site. A preliminary list of off-site remedial actions which should address those areas outside the Holden Landfill site boundary follows:

1. No action.
2. Interception/treatment of contaminated groundwater.
3. Interception/treatment of contaminated surface water drainage.
4. Removal of contaminated soil followed by secure disposal.
5. Combination of the above actions.

These alternatives will be examined after evaluating data developed from previous site characterization work, in conjunction with data collected for source control remedial actions and findings of the feasibility study.

Remedial Investigation

The objectives of remedial investigation for the Holden Landfill Site are to provide sufficient data to establish the extent of contamination in the vicinity of the Holden Landfill and to identify the pathways for contaminant migration in order to evaluate and screen remedial source control and/or off-site action alternatives. The remedial investigation work plan as well as remedial action alternatives and their feasibility studies may be revised depending upon data obtained from remedial investigations.

The general remedial investigation work plan is composed of a number of smaller more specific plans which address particular aspects of the field investigation and data analyses required. Prior to commencement of any remedial field investigation at the Holden Landfill site, a site safety plan must be prepared to provide for worker safety during anticipated site work conditions and possible field emergencies. A sample protocol and quality control plan will be developed and implemented for all analytical and sampling activities. Implementation of remedial actions may promote increased site drainage of contaminated materials. Therefore, a site drainage plan will also be developed and utilized during implementation of remedial actions to minimize possible increased site drainage. A plan to characterize waste contaminant source(s) on-site and off-site will be developed to outline particular areas for review such as landfill records and topographical maps. Previous geophysical studies undertaken at the site will require that a work plan be developed to analyze the electrical resistivity and seismic refraction data. For a complete discussion on the Remedial Investigation refer to Section 3.0.

Community Relations

A Community Relations Plan (CRP) proceeds concurrently with the overall site cleanup process and is proposed to promote public involvement in major decisions on remedial work and to promote understanding and support of remedial activities through periodic public meetings, direct informational mailings to residents and continuous updated communication with the news media.

The development and implementation of the Community Relations Plan is the responsibility of the Commonwealth of Massachusetts. State and federal on-site coordinators will act as the liason between the community and project officers.

Schedule and Cost of Remedial Planning Activities

Schedules and costs for remedial actions proposed for the Holden Landfill site have been developed and are presented in Section 4.0. A schedule by task for Remedial Actions at the Holden Landfill is presented in Figure 3.

Project Coordination and the Community Relations Plan are continuously performed throughout the entire remedial action process. The Initial Remedial Actions can be completed in four to six weeks assuming favorable weather conditions, access to sampling wells, and availability of a fence contractor, etc.

The Remedial Investigation Work Plan will take between 57 to 62 weeks for completion. The feasibility study will commence upon completion of the remedial investigations followed by remedial design and implementation. The feasibility study was estimated to take between ten to twelve weeks. Assuming a start date of January 17, 1983 for the RAMP, the feasibility study would begin in March of 1984. No time estimates are given for Remedial Design and Implementation which can only be developed after completion of the feasibility study and selection of a design consultant.

The total cost for all RAMP activities up to and including the feasibility study ranges from $337,200 to $412,850. A significant cost activity of this total is the remedial investigation work plan whose cost ranges from $170,800 to $222,500. The feasibility study costs have been estimated to range from $91,000 to $114,000. The combined costs of project coordination, community relations plan and initial remedial actions are estimated to range from $77,400 to $80,350. All costs given here are estimates and are based on assumptions contained in Section 4.0 of this report.

SECTION 1.
DATA COMPILATION AND EVALUATION

1.1 OBJECTIVE

The development of a comprehensive plan for appropriate remedial action at the Holden Landfill Site requires a determination of the source(s) of contamination and extent of contamination. Data, in addition to that obtained during previous investigations on and off site, are needed to complete the site-characterization process.

In order to determine the types of data that are needed, the existing data are compiled and evaluated for thoroughness and limitations. The resulting data gaps can then be identified, and methods of obtaining the required data can be developed.

1.2 BACKGROUND

1.2.1 Site Location

The Holden Site is situated in the Town of Holden, Massachusetts at the 15-acre sanitary landfill owned by the Town. The site is located in a sparsely populated and wooded area and can be reached via an access road from Wachusett River Street approximately 2000 feet east of its intersection with Harris Street. The Site can be located on the United States Geological Survey (U.S.G.S.) 15-Minute Sterling Massachusetts Quadrangle at the approximate coordinates of 42° 22' 40" North and 71° 49' 20" West (Figure 1).

1.2.2 Environmental Setting

The Holden Landfill site is bounded on the north by property owned by the Metropolitan District Commission (MDC), on the south by Wachusett River Street, on the east by Interstate 190, and on the west by a pond and wooded area. The landfill is located at an approximate elevation of 600 feet above mean sea level (MSL) and is 1500 feet south of the Quinapoxet River, which is at an elevation of approximately 460 feet above MSL.

Surface water from the landfill area flows either to the north towards the Quinapoxet River or to the south across Wachusett River Street to an unnamed brook which is a tributary to the Quinapoxet River. A low-lying swampy area exists to the southeast of the site across Wachusett River Street. Contaminated surface water drainage (referred to as "leachate" by EPA and DEQE officials) is located at several locations approximately 1200 feet north of the site along a steep embankment leading down to the Quinapoxet River.

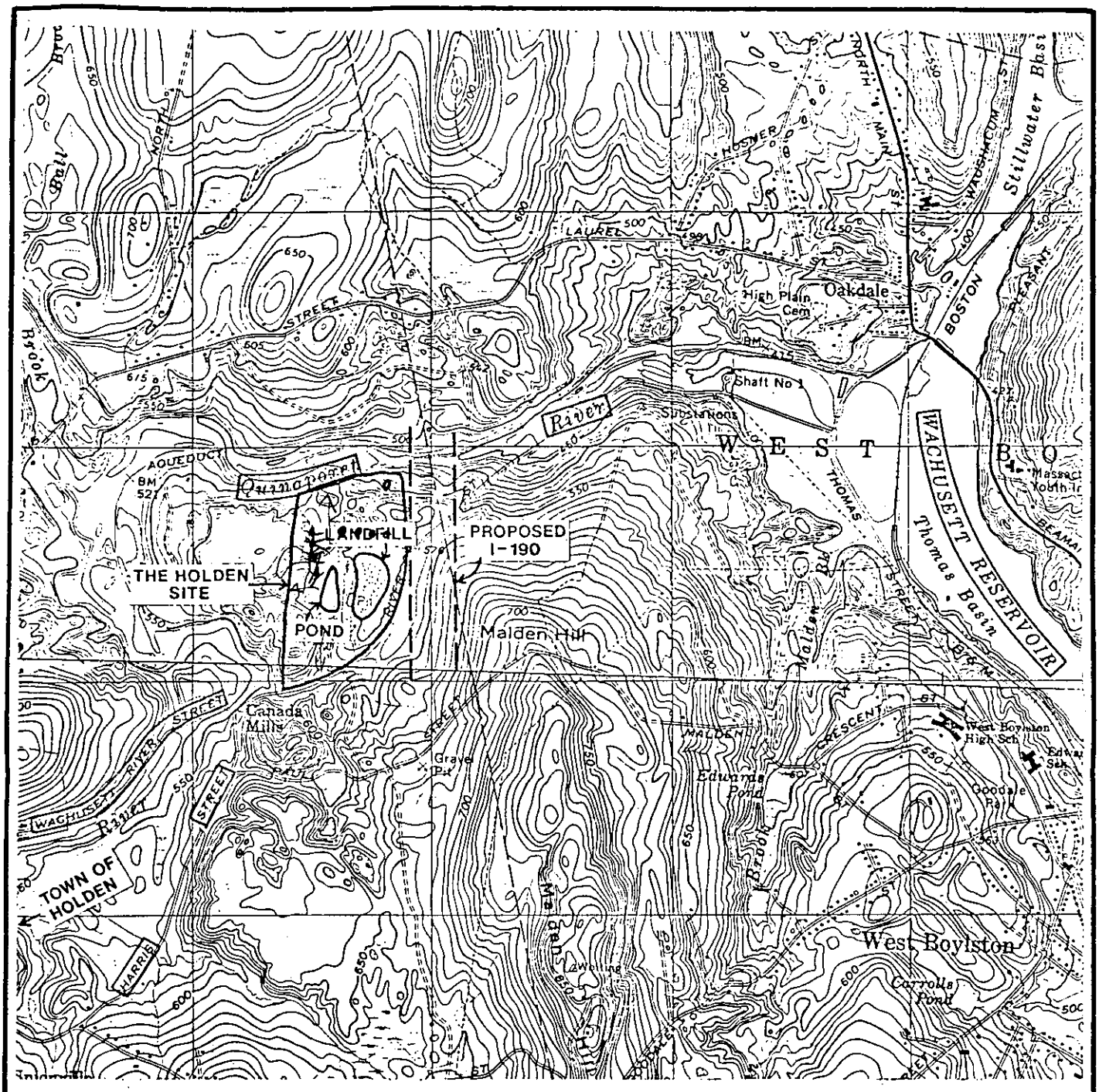


FIGURE 1: HOLDEN SITE LOCATION

From U.S.G.S. Sterling Quadrangle, 7.5 min. Series

Scale 1:25000

There is no public water supply or sewer system in this area; however, there is one well at the entrance to the landfill which is used for sanitary purposes at the site. There are six groundwater monitoring wells located to the north of the landfill on MDC property. Figure 2 shows an overall sketch of the site and adjacent areas, topographical contours and other characteristics. The Quinapoxet River is a main tributary to the Wachusett Reservoir which is located less than 1.5 miles downstream from the site along the Quinapoxet River as shown in Figure 1. The Wachusett Reservoir is part of the MDC system which supplies drinking water to approximately 2,000,000 people in the metropolitan Boston area.

1.2.3 Site History

The Town of Holden purchased the 15-acre site, previously used for sand and gravel mining, in 1959 and began using it for open dumping of municipal refuse. Dumping may have taken place in the pond immediately to the west of the dump site. In 1971, the open dump was converted to a sanitary landfill by incorporating site security (a fence and locked gate at landfill entrance) and utilizing cut and fill methods of landfilling. The landfill has received municipal refuse and some industrial wastes, however no data are available which specifically characterize these wastes. According to town officials, industries which may have disposed their wastes at the landfill include an electronics manufacturer, a tool and die manufacturer, a plastics manufacturer and a screw manufacturer.

In February 1980, the U.S. EPA environmental monitor for the Interstate 190 construction site observed what was believed to be a "leachate stream" discharging into the Quinapoxet River north of the landfill. Surface water samples were obtained from the Quinapoxet River at its confluence with the "leachate stream" by U.S. EPA personnel in March 1980 and were found to contain 1,1,1- trichloroethane (greater than 600 ppb), 1,1- dichloroethane (100 ppb) and other organic compounds at lower concentrations. As a result, the Commonwealth of Massachusetts Department of Environmental Quality Engineering (DEQE) requested the U.S. EPA to determine if the landfill was in violation of Section 311 of the Clean Water Act.

U.S. EPA personnel conducted a site inspection of the Holden landfill on 2 May 1980 and obtained samples from the pond, the "leachate stream", the Quinapoxet River and other surface water in the vicinity of the site. The "leachate stream" sample contained 1,1,1-trichloroethane (400 ppb) and other organic compounds at lower concentrations. On 28 May 1980, based on the analytical results of the 2 May sampling, the U.S. EPA declared the landfill site eligible for clean-up funds under Section 311 of the Clean Water Act.

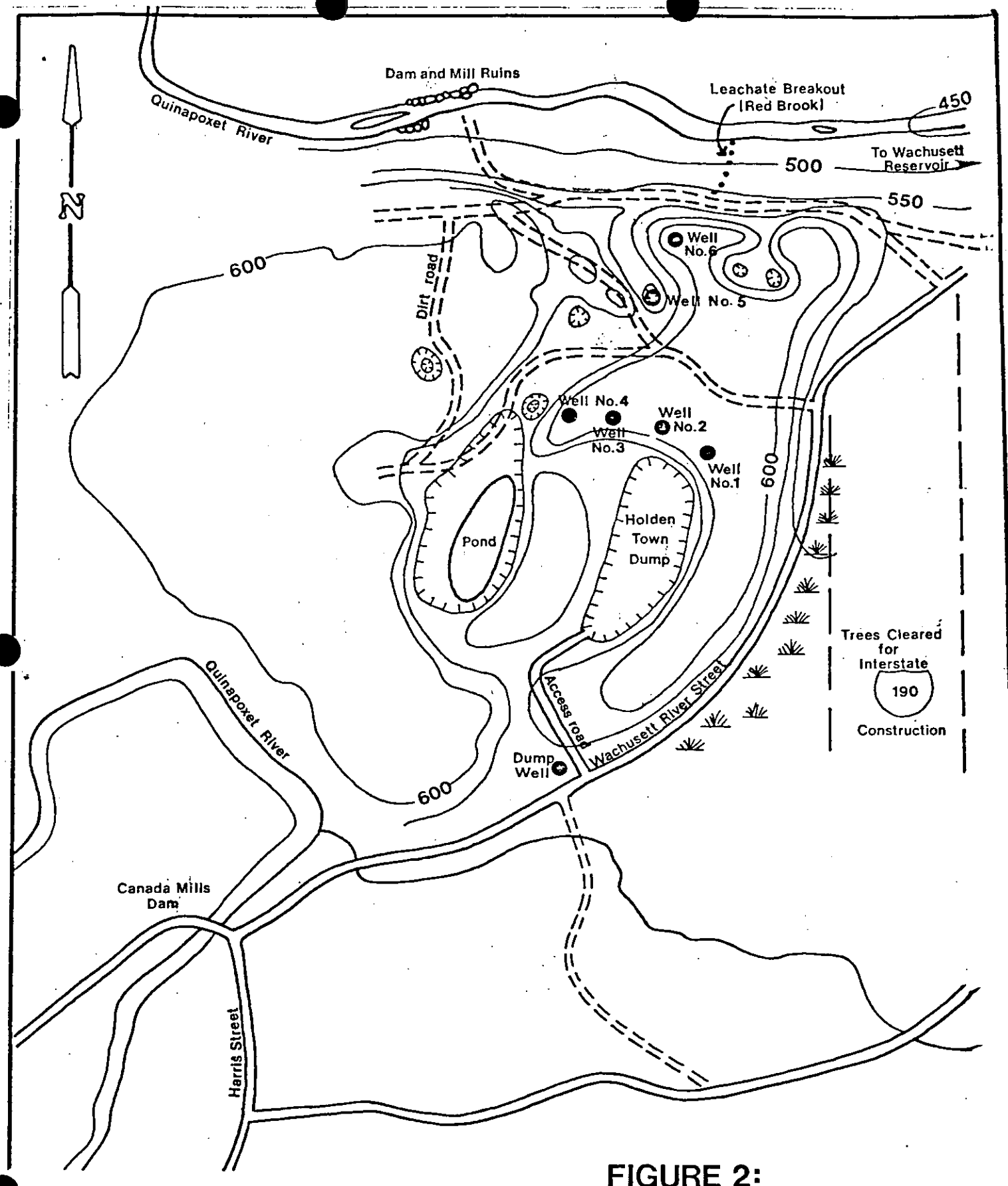


FIGURE 2:
HOLDEN SITE SKETCH
Not to scale

During the fall of 1980, the U.S. EPA and DEQE developed and implemented a joint strategy of investigation/mitigation for the landfill site. Included were the designation of DEQE as lead agency for the Holden investigations, the installation (by the U.S. EPA) of two "leachate control structures" in the "leachate streams", and the installation (by the DEQE) of six groundwater monitoring wells north of the landfill to be used in determining the source of contamination. This phase was completed in November 1980.

The first groundwater samples were obtained from the monitoring wells in January 1981. EPA analyses indicated the presence of organic contaminants in all six wells, including 1,1,1- trichloroethane at concentrations as high as 298 ppb. The U.S. EPA developed an Emergency Action Plan for the Holden landfill in February 1981 which proposed the following:

1. Hiring a consultant to determine groundwater flow patterns, define the extent of contamination, determine if the landfill is the contaminant source and present plans for the interception and treatment of contaminated groundwater.
2. Monitoring and maintaining the "leachate control structures".
3. Implementing the consultant's interception/ treatment plans.
4. Monitoring groundwater and surface water quality following implementation of the consultant's plans.

In March 1981, a consultant to the Massachusetts Department of Public Works, which had developed erosion control plans for the Interstate 190 bridge construction site, was asked by the U.S. EPA to evaluate the possibility that the bridge construction will adversely impact the Holden "leachate problem" and to recommend control measures should a problem arise during construction. Also in late March, the U.S. EPA conducted a site inspection in order to assess the environmental threat posed by the Holden landfill. As a result of their observations, the U.S. EPA concluded that groundwater and "leachate" flow from the landfill toward the Quinapoxet River. They also made several recommendations for obtaining additional data to further characterize the contaminant problem, including frequent surface water and groundwater sampling.

The consultant to the Department of Public Works responded to the U.S. EPA's March request to evaluate construction effect on the "leachate problem".

The consultant concluded that the bridge construction would not adversely impact the "leachate problem', however, if leachate was detected at the construction site, it would be pumped to the sand filters which were part of the erosion control system. On 1 May 1981, the DEQE cited the Town of Holden for violation of "Regulations for the Disposal of Solid Waste by Sanitary Landfill" (310 CMR 19:00, Regulations 19:2.1 and 19:21) and "Drinking Water Regulations: (310 CMR 22:00, Regulation 22:20(1)(3)). A show-cause conference was scheduled for 14 May 1981 by the DEQE to allow the Town of Holden to present reasons why the DEQE should not initiate further legal action against the Town.

The U.S. EPA proposed a sampling plan for the Holden site on 12 May 1981 with the objective of determining the presence, concentration and identity of the material "leaching from the Town Dump". Two rounds of surface water and groundwater sampling were proposed for the site and adjacent areas. The proposed Round I sampling plan consisted of 18 sampling locations and subsequent analyses to determine the qualitative presence of organics and the concentrations of selected inorganic and physical parameters. The proposed Round II sampling plan would only include those locations identified during Round I sampling as containing organic contaminants. The Round II samples would be quantitatively analyzed for priority pollutants and selected inorganic and physical parameters. The U.S. EPA also proposed the installation of additional groundwater monitoring wells if the results of Rounds I and II sampling indicated the need to determine the vertical and areal extent of the "leachate plume".

On 9 June 1981, DEQE responded to the evaluation made by the DPW consultant concerning the effects of the bridge construction on the "leachate problem". The DEQE stated that it was concerned about the construction activities altering the flow of "leachate" and adversely affecting the Quinapoxet River. DEQE also noted that the impoundments (used for erosion control) were not designed for the treatment of "leachate". A meeting between DEQE and DPW officials was scheduled for 25 June 1981 to discuss these concerns.

Round I sampling conducted by the U.S. EPA on 17 June 1981 and analyses were completed on 25 July 1981 by the U.S. EPA. Results of sample analyses indicated the presence of a number of organic compounds, including 1,1-dichloroethane, trans-1,2-dichloroethylene, vinyl chloride, benzene, toluene, ethyl-benzene, dioxane, xylenes and methyl isobutyl ketone at some of the sampling locations. During Round I sampling, the U.S. EPA also measured the depths to groundwater and well bottom in each monitoring well and concluded that the wells had not been properly constructed or sealed.

On 4 August 1981, the Town of Holden submitted a voluntary compliance plan to the DEQE which proposed further study and mitigation of the "low-level leachate contamination" problem. The voluntary compliance plan was submitted in response to the May 1 citation by the DEQE and served in place of a formal compliance order by the DEQE. The Town's compliance plan centered on three major actions directly related to the contamination issue, including a topographic survey of the landfill, a groundwater sampling program and a drainage and sealing plan for the working face and completed section of the landfill.

On 14 August 1981, the U.S. EPA proposed the installation of additional groundwater monitoring wells on and off site based on the sampling results. The proposal included (1) the installation of one upgradient well to replace the existing landfill well used to establish background water quality, (2) the installation of two downgradient wells to replace existing wells 1 through 4 which were not properly constructed, and (3) the installation of five additional downgradient wells to determine the lateral extent of the contaminant plume and to define attenuation and retardation of the organic contaminants.

On 18 August 1981, the U.S. EPA informed DEQE that they were in agreement with the conclusion that "much of the contamination found in the leachate" was attributable to the Holden landfill. They also agreed that available data did not indicate an immediate threat to the Wachusett Reservoir, however, they should continue to monitor the situation and develop a long-term solution to the "leachate discharge". Future steps that were agreed upon include (1) DEQE taking the position as lead agency in negotiating a voluntary settlement with the Town of Holden to develop a landfill closure plan and alternative means of solid waste disposal, (2) DEQE developing a monitoring plan for use in determining threats to the water supply (Wachusett Reservoir) and developing a long-term remedy for the problem, and (3) the installation of additional monitoring wells by the U.S. EPA.

The U.S. EPA obtained additional samples from two monitoring wells, the "leachate breakouts", the Quinapoxet River and Wachusett Reservoir on 3 November 1981. Sample analyses confirmed the presence of the contaminants that were identified during Round I sampling with the addition of 1,1,1-trichloroethane (at concentrations as high as 240 ppb in the "leachate breakouts"). A trace amount of toluene was also detected in the Wachusett Reservoir sample.

In September 1982, MDC notified DEQE that land owned by the MDC and adjacent to the Holden Landfill has been used by the Town of Holden for illegal disposal of solid waste. Subsequently, DEQE notified the Town of Holden and ordered the Town to stop further disposal on MDC property and develop a plan to remove the illegally deposited wastes.

On 1 October 1982, after conferring with the U.S. EPA, DEQE ordered the Town of Holden to complete the following steps to prevent leachate breakouts and subsequent flow into the Quinapoxet River:

1. Hire a qualified consultant by 15 December 1982 to devise a plan of leachate control and aquifer restoration to protect the Quinapoxet River and the Wachusett Reservoir.
2. Develop a written report by 15 November 1982 on the remaining life expectancy of the Holden Landfill.
3. Notify DEQE by 1 November 1982 concerning alternatives the Town intends to investigate relative to solid waste disposal for the Town of Holden.

Subsequently the Town of Holden agreed to meet the terms and conditions of the DEQE order. At a 1 November 1982 Town Meeting, Town officials agreed to request public monies in an article concerning problems of leachate allegedly related to the Town's landfill.

1.2.4 Previous E&E Investigations

On 10 September 1981 the U.S. EPA requested Ecology and Environment, Inc. (E & E) to perform a preliminary assessment of the site, to evaluate possible effects and hazards of the contaminants, and to recommend further study and/or emergency action for the site. E & E's Field Investigation Team (FIT) conducted a perimeter site survey on 23 November 1981 to observe site characteristics in general. E & E completed the preliminary assessment on 8 December 1981 and recommended the following strategy:

1. Perform a site inspection to characterize air and surface water quality;
2. Continually monitor surface water quality in the pond, "leachate breakouts", Quinapoxet River and Wachusett Reservoir;

3. Perform a topographic survey of the site and adjacent areas to develop a base map of site topography;
4. Perform a full field investigation of the site including an electrical resistivity survey and a seismic survey;
5. Develop and implement a groundwater monitoring well strategy to assess and monitor the contaminant plume.

On 14 December 1981, E & E performed a site inspection of the Holden site at the request of the U.S. EPA. Surface water samples were taken from a brook to the south of the site, a brook to the east of the site, the Quinapoxet River, the "leachate breakouts" and the pond. Quantitative analysis by an organic vapor analyzer (OVA) detected 1,1,1-trichloroethane in samples taken from the brook to the east of the site and the major "leachate breakout" (Red Brook). Contaminants were not detected in any of the other surface water samples.

E & E subcontracted a topographic survey of the site and surrounding areas in April 1982. The surveyors established temporary bench marks throughout the site and developed a topographic base map of the study area for use in future field investigations on and off site.

In May 1982, E & E's FIT performed an electrical resistivity (ER) survey of the study area. Specialized instruments were used to determine changes in the electrical resistivity of subsurface materials over approximately 125 acres. In principle, the changes in electrical resistivity can be related to varying subsurface characteristics. The ER data will be interpreted and used by EPA to determine the types of subsurface materials and, if possible, the depths to groundwater and bedrock. An ER survey can also be used in some cases to determine the location and extent of a contaminant plume. Data obtained during the ER survey will be used in conjunction with other geophysical data (seismic refraction) to determine feasible locations for additional groundwater monitoring wells on and off site.

On 13 May 1982, E & E's FIT obtained surface water samples from the "leachate breakout" (Red Brook) a drainage channel to the north of the landfill, the Quinapoxet River, and groundwater samples from the Town of Holden landfill well and six groundwater monitoring wells to the north of the landfill. Quantitative analysis of the samples by an OVA detected volatile organics in the six groundwater monitoring well samples and two of the three Red Brook samples. Contaminants that were detected include trichloroethylene, 1,1,1-trichloroethane, benzene, toluene, ethyl-benzene, and trans-1,2-dichloroethylene.

In November 1982, E & E subcontracted for a seismic refraction (SR) survey to be conducted within the study area. SR is a subsurface geophysical investigative technique which transmits and receives subsurface seismic waves generated in this case by buried explosive charges. Field data interpretations are based on the measurement of the time required for those waves, generated at a point source, to travel to a series of vibration-sensitive devices (geophones or seismometers). These geophones are spaced at known intervals along a straight line on the ground surface. This instrument array is called a seismic spread survey line. These survey lines were staked out within the study area at the approximate locations of the ER survey lines in order that data from both geophysical studies can be compared and evaluated. The SR study will provide profiles of all surveyed lines showing the elevations for ground surface, water table, bedrock and any other stratigraphy where possible. The locations of all SR survey lines will also be plotted on a reproduceable site topographic base map. Final completion of all SR field work and transmittal of profiles, map and other data is scheduled for early December 1982.

1.3 DATA REQUIREMENTS

Data are required in order to develop, screen and evaluate remedial action(s) for both source control remedial actions and off-site remedial actions. Feasibility studies of selected remedial actions or combinations of remedial actions will require even further on-and off-site data. The exact data requirements for remedial actions or combinations of remedial actions are covered in Sections 2.5.2 through 2.5.3 and Sections 2.6.2 through 2.6.3. These data will be obtained during the remedial site investigations as proposed and discussed in detail in Section 3.0 of this RAMP entitled Remedial Investigation Work Plan. The cost of this data-gathering remedial investigation is covered under Section 4.4.

SECTION 2.
REMEDIAL PLANNING ACTIVITIES

2.1 INTRODUCTION

Ecology and Environment's approach to remedial planning activities for an uncontrolled hazardous waste site is presented in Figure 3. E & E's approach is based on guidelines presented in the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300) for remedial planning and action, and on other previous remedial action reports prepared for EPA.

As previously discussed, these remedial planning activities become part of a Remedial Action Master Plan (RAMP). This report serves as the RAMP for the Holden Landfill site and is based on the approach to remedial action planning as described above.

Remedial planning activities are developed for those uncontrolled hazardous waste sites which are listed on the National Priority List. Remedial alternatives developed as part of a RAMP serve to prevent or mitigate the release of and/or damage from hazardous wastes. The remedial planning activities in a RAMP are used as a planning tool for the U.S. EPA or other lead Federal agency to develop, select and implement all remedial clean-up measures for a particular hazardous waste site.

The final version of a RAMP and the remedial planning activities included in it are also based on the U.S. EPA and Commonwealth of Massachusetts review comments. This final RAMP then serves as the workscope for the U.S. EPA-State cooperative remedial clean-up agreement.

2.1.1 General Description of Remedial Planning Activities

This RAMP for the Holden Landfill site which outlines all various remedial planning activities consists of five individual activities or tasks. These tasks are as follows:

1. Project Coordination
2. Community Relations Plan
3. Initial Remedial Action(s)
4. Source Control Remedial Action(s)
5. Off-site Remedial Action(s)

The Project Coordination addresses the on-scene coordination and management of remedial planning activities. The Community Relations Plan promotes public involvement during remedial planning activities and during major decisions on remedial work. Initial Remedial Action(s) are implemented within a short period of time in order to limit exposure or threat of exposure to an immediate health or environmental hazard. The Source Control Remedial actions task includes the evaluation and screening of on-site remedial alternatives. These alternatives would control, contain, treat and/or dispose of hazardous wastes sources found on-site. This task would include a feasibility analysis of the selected source control remedial alternative and its final design and implementation. The off-site Remedial Action task describes those remedial alternatives which seek to mitigate impacts of hazardous wastes which have migrated off-site. The off-site remedial alternatives will also be evaluated and screened and a feasibility study will be conducted before any final design or implementation.

2.1.2 Development of a Comprehensive List of Remedial Action Alternatives

In order to evaluate, develop and implement remedial actions either on site (source control) or off site, a list of remedial alternatives must first be developed. These alternatives must cover a wide range of remedial actions from no action to waste encapsulation to waste interception and treatment to a combination of several alternatives. The list of remedial action alternatives can only be developed after completion of all site remedial investigations. These investigations will provide enough information on the Holden Landfill site in order to finalize the list of remedial action alternatives which will then allow the alternatives to be evaluated and screened. The data requirements and necessary remedial investigation are discussed more fully in subsequent sections of this RAMP.

2.2 PROJECT COORDINATION

Commonwealth of Massachusetts officials will oversee all aspects of remedial planning and action and provide on-scene coordination, when necessary. This would include (1) developing requests for proposals for consultants and subcontractors, (2) reviewing the results of the remedial investigation, (3) determining the appropriate type(s) of remedial action,

(4) reviewing the development of remedial action alternatives, (5) reviewing the results of the feasibility study, (6) selecting the feasible remedial alternatives(s), (7) reviewing remedial design, (8) supervising initial and final remedial action implementation, and (9) coordinating Federal/State permit acquisition.

State officials will also develop and implement a Community Relations Plan and the Long-term On-site Monitoring. The costs and scope of these projects are presented separately.

2.3 COMMUNITY RELATIONS PLAN

A Community Relations Plan (CRP) is proposed to promote public involvement during the various phases of the remedial activity and to inform and consult with the public at major decision-making points. The development and implementation of the Community Relations Plan is the responsibility of the Commonwealth of Massachusetts.

The primary mechanisms for this effort will be public meetings as work progresses or major decisions are made, direct informational mailings to residents and continued communication with news media. State and Federal on-site coordinators will act as the liason between the community and project officers.

The objectives of the CRP are as follows:

1. Promote public understanding and support for remedial actions;
2. Encourage active public discussion in the various planning phases associated with the remedial tasks;
3. Keep the public informed of any significant changes in project design;
4. Assure that no responsible agency decision on any activity significantly affecting the public is made without first informing and consulting interested and affected citizens;
5. Assure that responsible agency decision- makers receive, consider and respond to public concerns when making key decisions;
6. Promote mutual trust and openness between responsible agencies, elected officials and the public.
7. Assure that work progress is accurately and fully reported via press releases.

After development of the CRP during the initial stages of a RAMP, it is implemented and proceeds concurrently with the overall site cleanup process. The estimated cost of the CRP is discussed in Section 4.0 Schedule and Cost Estimates of Remedial Planning Activities.

2.4 INITIAL REMEDIAL ACTIONS

As part of a RAMP, initial remedial actions can be implemented by the State at the site in order to limit exposure or threat of exposure to an immediate health or environmental hazard. These actions which are limited in scope, require a minimum of planning. They are generally conducted as a "fast-track" approach, usually address "source control" and are performed separately from the remainder of the RAMP tasks. There are many factors which may indicate that initial remedial action is appropriate. Th s ude potential direct contact with hazardous substances, above ground storage of hazardous substances or highly contaminated soils or a threat of fire or explosion.

2.4.1 Site-Specific Objectives

The site-specific objectives for initial remedial actions for the Holden Landfill site are as follows:

1. Protection and analysis of all public and private water supply systems within a three- mile radius of the site.
2. Provide security precautions for the off-site contaminated surface water drainage area (Red Brook).

2.4.2 Identification and Evaluation of Initial Remedial Actions

It has been determined that 1) there exists a potential for off-site groundwater contamination and 2) there is a potential public health hazard from direct contact with the off-site contaminated surface water drainage (Red Brook). These conclusions are based on available analytical data and information obtained for a site evaluation and Superfund ranking using the Hazardous Ranking System (HRS) forms (revised July 1982). Cost estimates for these initial remedial actions are given in Section 4.0 entitled Schedule and Cost Estimates of Remedial Planning Activities.

2.4.2.1 Sampling/Analysis of Private Wells on Malden Street in Holden and Town Wells in West Boylston

In order to evaluate receptors of potential groundwater contamination from the Landfill site for the HRS form, a radius of influence of three miles around the site was used. The Quinapoxet River most likely serves as a groundwater barrier to the north and west of the site, therefore only areas to the south and east of the site were considered as receptors for any possible groundwater contamination whose source would be the Holden Landfill site. Current and proposed remedial site investigations may determine that all groundwater flow from the site moves in a northerly direction. However, initial remedial actions are fast-tracked and are undertaken separately from the remainder of the RAMP tasks so conclusive proof of groundwater flow patterns may not be available for initial remedial action planning.

The only private drinking water wells within three miles south or east of the site are located on Malden Street in Holden. There are approximately twenty private wells on the street and it is recommended that all these wells be sampled for volatile organic analysis by gas chromatography/mass spectrometry (GC/MS).

The only public water supply wells within this area of concern are located in the Town of West Boylston. There are three public water supply wells in use in West Boylston and these should also be sampled for volatile organic analysis by GC/MS as part of the initial remedial actions.

2.4.2.2 Installation of Fence and Warning Signs at Locations of Contaminated Surface Water Drainage (Red Brook)

Site security is an important factor when planning initial remedial actions. It is used to prevent unauthorized entry to an uncontrolled hazardous waste site and to limit human or animal exposure to hazardous wastes or contaminants. The active landfill site, which has a front gate and is locked when not in use, is not secured around its perimeter by any fence or other means. However, the landfill site itself does not pose any immediate public

health or direct contact hazards. The off-site contaminated surface water drainage located north of the landfill may pose a public health or direct contact hazard, therefore it is recommended that this area be secured. Even though this off-site area is in a rural setting, many fishermen and four-wheel drive vehicle enthusiasts have been observed in the immediate area.

More specificially, the area surrounding Red Brook (approximately 1200 linear feet) should be enclosed by a six-foot high, nine-gauge, galvanized steel fence. Warning signs sized at least 12 inches by 18 inches should also be posted along the fence at 100 foot intervals which would inform individuals of the hazardous nature of the enclosed area.

2.4.3 Implementation of Initial Remedial Measures

It is strongly recommended that the initial remedial actions be implemented as soon as the workscope for the U.S. EPA-State cooperative remedial clean-up plan has been agreed to by both parties. Additional information that could be provided by proposed remedial site investigations is not needed in order to perform or contract out the sampling/analysis and security actions as previously described. The implementation of these initial remedial actions should not affect in any way, proposed or future site remedial actions. The only purpose of the initial remedial actions is to limit exposure or threat of exposure to an immediate health or environmental hazard as soon as possible.

2.5 SOURCE CONTROL REMEDIAL ACTION(S)

Source Control Action(s) should be considered for this site due to the fact that domestic and industrial wastes were disposed of at the Holden Landfill over a period of several years. Early waste disposal practices would not have provided any barrier preventing contamination leaving the site, therefore, determination of all site source(s) and their control or elimination should be completed. This can only be accomplished after successfully completing a feasibility study of selected remedial control actions.

2.5.1 Site-Specific Objectives

The first objective for this section is to evaluate and screen source control remedial actions for the Holden site. The main objective, after initial screening, is to perform a feasibility study of the remaining source control remedial actions leading to final selection and design/ implementation of the selected action.

2.5.2 Identification of Data Requirements

The Holden site has not been fully characterized. Therefore, full evaluation of all source control remedial actions cannot be undertaken until more data is gathered on site. Specifically, all source(s) of contamination must be identified, through the use of geophysical measuring techniques, sampling and analysis and identification of those areas where industrial wastes may have been incinerated, buried or deposited. Groundwater flow patterns and bedrock contours for the Landfill site must also be established in order to screen the remedial actions. An additional data requirement would include the identification of disposal area(s) off site which accept hazardous materials for secure disposal. The information described above must be obtained before any preliminary evaluation or initial screening of source control remedial action(s) can be completed. Data requirements for the consideration of each alternative identified are discussed in detail in Sections 2.5.3.1 through 2.5.3.5 and in the Remedial Investigation Work Plan.

2.5.3 Preliminary Evaluation and Initial Screening of Source Control Remedial Actions

After identifying all source(s) of contamination, a list of source control remedial actions can be developed for each source. This list is first evaluated to eliminate any actions which could not be implemented due to regulatory constraints, permit considerations, site specific conditions or other readily apparent restrictions.

Following this preliminary source control evaluation, the options are more fully screened in order to determine those options which will require performance of a feasibility study. As previously mentioned, existing data for source control options screening is insufficient and remedial investigation studies must be conducted to provide this data. There should also be close coordination between those planning the remedial studies and those involved in the subsequent feasibility studies. Sufficient data may be gathered for the feasibility studies during the remedial site investigations and data interpretation.

After the necessary data is obtained from the remedial site investigations, the source control options are screened and a reduced site list of control options or combination of options is made up for each contaminant source(s). Options may be eliminated in this initial screening based on technical evaluation, applicability to site specific restraints, implementability and cost-effectiveness.

A feasibility study will then be conducted on the screened source control remedial options. A feasible, cost-effective source(s) control option will be recommended for design and implementation after the feasibility study is completed.

A preliminary list of source control remedial actions for source(s) of contamination at the Holden Landfill site are as follows:

1. No action
2. Interception/treatment of contaminated groundwater
3. In-situ encapsulation of contaminant source(s)
4. Removal of contaminant source(s) followed by secure disposal
5. Combination of the above actions.

Other source control actions may be added to this list after further site remedial investigations for sources of contaminants and subsequent data analysis and interpretation.

A brief description of each of the proposed source control actions is given below:

2.5.3.1 No Action

This no action alternative would be implemented if the present Holden Landfill site is determined to have no significant contamination/public health impacts or hazards to the environment. This conclusion could only be reached after further site remedial investigations have been conducted. A no action source control alternative is also possible if it is determined that off-site remedial actions will eliminate all contamination which migrates off-site. The key components of a comprehensive risk analysis evaluating the potential impacts of the no action alternative is presented in Section 3.5 of the Remedial Investigation Work Plan.

2.5.3.2 Interception/treatment of contaminated groundwater

This alternative involves interception and removal of contaminated groundwater from on-site groundwater contaminant plume(s). The contaminated groundwater is then subjected to treatment and the final effluent is discharged back to the environment. The purpose of this alternative is to remove and eliminate groundwater contamination which results from past on-site disposal of hazardous or industrial wastes. In order to undertake this source control alternative, remedial site investigations must first determine the following information:

a. Identify source or sources of on-site contamination.
b. Determine direction(s) of groundwater flow.
c. Establish lateral and vertical extent of contaminated groundwater flow.
d. Quantify and identify contaminants found in groundwater plumes.
e. Establish bedrock profiles on-site.

This information would allow a preliminary evaluation and initial screening to be completed on this source control alternative. A feasibility study must be performed on this alternative if preliminary screening is favorable. There are many issues which will need to be addressed during this analysis. These issues may be divided into the following categories:

o Groundwater Removal:

a. Cost-effectiveness and feasibility of on-site versus off-site groundwater removal.

b. Removal technique: Trenches, collection pipe network, well points, deep wells, etc.

o Groundwater Treatment:

a. Method of treatment: Physical, chemical or biological treatment or combinations of treatment, air stripping vs. carbon adsorption vs. no treatment with placement back into groundwater upgradient from removal point(s), or on-site lagoon with off-site treatment/disposal.

b. Treatability studies: Bench scale testing of the contaminated groundwater using proposed treatment method(s) with consideration for seasonal groundwater contaminant fluctuations.

c. Treatment standards: Establishment of appropriate effluent quality or treatment performance goals.

d. Treatment facility: Long-term maintenance and operation of such a facility and decision criteria to determine if groundwater treatment is no longer necessary for this site.

o Disposal of treated groundwater:

a. Method(s) of final disposal: Injection back into the groundwater aquifer or gravity feed into the Quinapoxet River, etc.

b. Impacts on existing uncontaminated groundwater or surface water quality for the receiving waters.

After completion of a feasibility study which addresses the issues listed previously, a decision must be made on the possible selection of this alternative as a source control measure. If this alternative were to be selected for final design and implementation, a pilot-scale treatment facility would most likely be constructed in order to develop final design parameters.

2.5.3.3 In-situ encapsulation of contaminant source(s)

This alternative contains the waste source(s) on-site in-situ without any removal of wastes, thereby eliminating the possibility of further groundwater contamination occurring from these on-site sources. Source encapsulation is therefore different in nature from the previously described alternative which seeks to control the groundwater contamination which results from on-site source(s) but does not contain or eliminate these sources.

There are many ways to encapsulate or contain buried wastes. The objective is to prevent surface water (precipitation) and upgradient groundwater from infiltrating the area where the wastes are buried, leaching out contaminants and then transporting these contaminants off-site in the groundwater aquifer. Impermeable barriers (synthetic liners or natural clay materials) may be placed over the surface of the waste disposal area(s) in order to prevent infiltration of surface water or precipitation. In order to prevent contamination from entering groundwater in the immediate vicinity of the buried waste(s), a physical barrier must be constructed in the ground surrounding the waste source(s). This barrier could consist of a slurry wall, concrete grout curtain or other physical barrier which would prevent lateral off-site migration of contaminated groundwater. However, if the bedrock surface lies a considerable distance below the depths at which the wastes are buried, there is still a pathway for groundwater contamination. This situation could result in the contamination of groundwater moving underneath the waste(s) along the relatively impermeable bedrock surface.

There is insufficient on-site information to evaluate and screen this particular on-site source control remedial alternative. The followi-g remedial site investigations are necessary in order to fully evaluate this alternative:

a. Location of on-site waste source(s).
b. Evaluation of lateral and vertical extent of buried wastes.
c. Determine depth to bedrock or other impermeable soil layers beneath the buried waste source(s).

If this source control alternative is selected for a further feasibility study, there are also a number of issues which would have to be addressed and they are as follows:

a. Feasibility and cost-effectiveness of constructing an in-situ physical groundwater barrier if bedrock is 100 feet from the existing surface grade, as is indicated by the preliminary results from the geophysical site investigation.
b. The effects of the contaminants on the impermeable surface barrier or groundwater barrier.
c. Long-term integrity of the in-situ barriers.
d. Responsibility and determination of the effectiveness of impermeable barriers over the long-term to prevent or detect any off-site contamination.
e. Planning on or off-site remedial work if there is a failure in the barriers.

These issues are just some of the concerns which must be addressed during a feasibility study of this alternative. Final design and implementation of such an alternative would require further study on items such as types of barriers to be used and construction techniques.

2.5.3.4 Removal of contaminant source(s) followed by secure disposal

This alternative proposes to excavate all buried wastes or other materials which may be causing groundwater contamination on-site. The excavated waste material, after temporary on-site storage for classification, would be transported off-site to an approved secured landfill disposal area. Locations for temporary secure storage for solid wastes excavated at the Holden landfill site during remedial activities will also have to be identified in conjunction with the development of a site drainage plan. The site drainage plan is discussed in more detail in Section 3.4 of the Remedial Investigation Work Plan. The objective for this alternative is to remove all source(s) of groundwater contamination that exist on-site in a manner that is environmentally acceptable.

There are several concerns which should be addressed before this alternative is evaluated and screened. The answers to these concerns are crucial to any further alternative evaluation. Some of these concerns are:

- Meeting all permitting requirements for hazardous waste temporary on-site storage, handling, transportation and disposal.
- Meeting environmental or public health/safety liability concerns for the Town of Holden during the course of hazardous waste excavation, temporary on-site storage, handling, transportation and disposal.

After these concerns are satisfactorily addressed, this alternative can be evaluated and screened. As with all other source control alternatives previously described, there is insufficient data at present to adequately evaluate this alternative. Remedial site investigations would have to determine, as a minimum, the following information:

a. Location, depth and extent of on-site waste source(s).
b. Identification of waste types and quantities.
c. Identification of suitable on-site areas for temporary hazardous waste storage for waste identification, bulking etc. in preparation for off-site removal, transportation and final secured disposal.

The feasibility study of this particular alternative would be important, focusing on the following issues:

a. Protection of further groundwater degradation during buried waste excavation.
b. Safeguards and protective measures for worker safety with respect to the removal of on-site buried wastes.
c. Protection of the on-site Pond, which is not presently contaminated, against contamination during the waste removal process and temporary on-site waste storage.
d. Type of construction/excavation techniques which could be employed to remove wastes intact.

The selection of this source control alternative is dependent upon the completeness with which these issues are addressed.

2.5.3.5 Combination of the Above Actions

In order to adequately address on-site source control, it may be necessary to combine two or more of the source control alternatives. This can only be determined after the additional data requirements for each alternative as outlined previously have been met as a result of the remedial site investigations. The selection of any source control alternative or combination of alternatives is based upon the results of the feasibility study after the additional data and preliminary screening is completed.

2.5.4 Detailed Feasibility Study of Remaining Source Control Remedial Action(s)

In addition to those issues previously listed for each source control alternative, all remaining alternatives would be evaluated on technical feasibility (including any public health/safety impacts), cost effectiveness and environmental assessment. The results of the evaluation would provide the basis for the selection of the most appropriate remedial source control alternative after consideration of all pertinent factors.
The technical feasibility analysis would include the refinement and specification of each alternative with respect to engineering implementation and constructability. Specific attention would have to be given to the impact on public health and the safety of construction practices. Bench scale testing would confirm feasibility of treatment schemes identified and establish preliminary design criteria. The capital and operating costs would be developed followed by a life cycle analysis to identify the most cost-effective alternative.

An inventory of environmental issues should be established for the alternative or combination of alternatives, identified as both cost effective and technically feasible from this analysis. Measures to mitigate any adverse environmental impacts identified should then be developed along with their respective costs.

2.5.5 Design/Implementation of Selected Source Control Remedial Action(s)

The remedial design would begin following the selection of the on-site source control alternative(s) determined from the feasibility analysis. Detailed design specifications and contract documents would be developed for use by a construction contractor. Cost estimates, project scoping, and detailed scheduling of the remedial design would be developed at the time the design consultant is engaged.

2.5.6 Long-term On-site Monitoring

After design and implementation of source control alternative(s), the site should be monitored to 1) assess the adequacy of the alternative used, 2) determine that all waste sources have been contained or eliminated and 3) identify any containment failures over a period of time. Continued or future

groundwater contamination would be the main concern after implementation of source control alternative(s), therefore, a groundwater monitoring well program should be developed. This monitoring well program should locate and install monitoring wells downgradient from contained or removed on site waste source(s) if suitable groundwater monitoring wells do not already exist based on prior site remedial investigations. A long-term monitoring well program must also address the responsibility for well maintenance, sampling and analysis. Contingency plans should also be formulated in the event that long-term groundwater well monitoring, sampling and analysis detected continued or new groundwater contamination.

2.6 OFF-SITE REMEDIAL ACTION(S)

On-site source control initial remedial measures and remedial actions will mitigate the future potential release of contaminants from site specific sources and thereby prevent further off-site contamination. However, additional measures may be required to mitigate impacts of those wastes already off-site.

Off-site remedial actions should address those areas outside the Town of Holden Landfill Site boundary (including MDC property and Commonwealth of Massachusetts property to the north of the Site) after determination of the potential hazards and associated risks. Review of available data supplied by the U.S. EPA and Massachusetts DEQE indicates that surface water drainage carrying contaminants has migrated north of the site to the Quinapoxet River, a tributary of the Wachusett Reservoir and ultimately part of the MDC water supply system. The potential for significant off- site groundwater contamination must also be addressed.

2.6.1 Specific Objectives

To mitigate or stop migration of contaminants at off-site locations, the following objectives have been identified:

- Identification and selection of the most promising off-site remedial action(s) for consideration in the feasibility analysis.
- Supervision and review of quality assurance procedures for the excavation/removal of earthwork on MDC property.
- Assessment of risk for the various alternatives.

2.6.2 Identification of Data Requirements

Sufficient data will be required to identify and evaluate off-site remedial actions. Data developed from previous site characterization work, in conjunction with data collected for the initial remedial measures and the source control remedial actions, may serve to meet some of the following specific data requirements:

- o Identification of secure licensed waste disposal facilities for contaminants identified off-site requiring possible removal.
- o Qualitative and quantitative data for surface water drainage streams north of the site with consideration for seasonal variations.
- o Qualitative and quantitative data for the Quinapoxet River upstream, at the confluence of the surface water drainage stream, and downstream with consideration for seasonal variations.
- o Characterization and monitoring program for groundwater quality, flow rate, and off-site direction with consideration for seasonal variations.

Site specific groundwater monitoring work for removal of the Town of Holden wastes on MDC property should be reviewed by EPA officials. Data developed from this work may reduce the number of monitoring wells needed additionally to characterize groundwater conditions. Coordination between the Town of Holden and State agencies will result in the most cost-effective site investigations.

2.6.3 Preliminary Evaluation and Initial Screening of Off-site Remedial Action(s)

After identifying all off-site contamination problems, a list of off-site remedial actions can be developed for each problem. This list is first evaluated to eliminate any actions which could not be implemented due to regulatory constraints, permit considerations, site specific conditions or other readily apparent restrictions.

Following this preliminary off-site remedial action evaluation, the options are more fully screened in order to determine those options which will require performance of a feasibility study. As previously mentioned, existing data for off-site remedial action screening is insufficient and

remedial investigation studies must be conducted to provide this data. There should also be close coordination between those planning the remedial studies and those involved in the subsequent feasibility studies. Sufficient data may be gathered for the feasibility studies during the remedial off- site investigations and data interpretation.

After the necessary data is obtained from the remedial off-site investigations, the off-site remedial action(s) are screened and a reduced list of actions or combination of actions is made up for each contaminant problem. Actions may be eliminated in this initial screening based on technical evaluation, applicability to site specific restraints, implementability and cost-effectiveness.

A feasibility study will then be conducted on the screened off-site remedial action(s). A feasible, cost-effective off-site remedial action wil be recommended for design and implementation after the feasibility study is l completed.

A number of off-site remedial actions for the Holden Site include but should not be limited to the following:

- o Interception/treatment of contaminated groundwater.
- o Interception/treatment of contaminated surface water drainage.
- o Removal of contaminated soil followed by secure disposal.
- o Combinations of the above actions.

2.6.3.1 No Action

The no action alternative requires the determination of the impact from know surface water drainage contaminants on the Quinapoxet River and Wachusett Reservoir which ultimately supply drinking water to the MDC service area. n Specific data requirements necessary to evaluate the no action alternative are detailed in Section 3.5 of the Remedial Investigation Work Plan.

2.6.3.2 Interception/Treatment of Contaminated Groundwater

This alternative involves interception and removal of contaminated groundwater from off-site groundwater contaminant plume(s). The contaminate groundwater is then subjected to treatment and the final effluent is discharged back to the environment. The purpose of this alternative is to d remove and eliminate groundwater contamination which results from past on-site disposal of hazardous or industrial wastes.

Based on the results of the groundwater characterization off-site, a series of interception facilities may need to be constructed to intercept and treat the groundwater flow so that it does not carry contaminants to the Quinapoxet River. Data to date is insufficient to determine the existence and extent of contamination. If the contaminated zone is shallow, it may be possible to construct a series of interceptor trenches installed in conjunction with full or partially penetrating slurry walls, or similar barrier walls to trap contaminants for further treatment. Should the contamination be deeper than can effectively be intercepted through such trenches, a series of closely spaced well points may need to be considered to hydraulically intercept the contaminated plume for treatment.

There are many proven treatment options available to consider for processing aqueous wastes. Organic wastes can be biologically treated to remove the organic contaminants from the aqueous phase and, if required, a granular activated carbon filtration process can be used to remove large-molecular organic chemicals prior to discharge of the aqueous phase. Inorganic aqueous wastes can be processed by many different methods; however, typically a neutralization-precipitation process can effectively remove most inorganic contaminants. Other processes for treatment inorganic wastes include ion exchange, reverse osmosis and evaporation. During the feasibility study analysis, bench scale tests using groundwater from a downgradient well penetrating a contaminant plume would verify the effectiveness of the treatment scheme.

In order to undertake any off-site remedial action alternatives, remedial site investigations must first determine the following information:

a. Identify areas of off-site contamination.
b. Determine direction(s) of groundwater flow.
c. Establish lateral and vertical extent of contaminated groundwater flow.
d. Quantify and identify contaminants found in groundwater plumes.
e. Establish bedrock profiles off site.

2.6.3.3 Interception/Treatment of Contaminated Surface Water Drainage

A comprehensive alternative for the collection/ treatment of surface water drainage can be developed from a review of available data in conjunction with additional data identified in the off-site data requirements. In order to determine feasibility, data must be developed to characterize seasonal variations in flow and concentrations of contaminants. Surface water treatment schemes for consideration include combinations of physical, chemical and biological processes as discussed previously in Section 2.6.3.2.

2.6.3.4 Removal of Contaminated Soil followed by Secure Disposal

This alternative proposes to excavate and remove heavily contaminated soil in the vicinity of contaminated surface water drainage which may be causing groundwater contamination off site. The excavated soil, after temporary off-site storage for classification, would be transported to an approved secured landfill disposal area. The objective for this alternative is to remove all source(s) of groundwater contamination that exist off site in a manner that is environmentally acceptable.

The removal of heavily contaminated soil, specifically in the area of surface water drainage streams north of the Site, may provide an effective alternative for off-site remedial actions. Data developed for the surface water drainage streams will establish the extent and degree of soil contamination. Other potential sites for soil contamination may also be identified during the remedial investigation work. The volume of contaminated soils identified will be a key factor in determining feasibili for the removal/disposal of contaminated soils off site. Another factor to be considered for a feasibility study would be methods for safeguarding and protecting those workers who would excavate and remove contaminated soil.

There are several concerns which should be addressed before this alternative is evaluated and screened. The answers to these concerns are crucial to any further alternative evaluation. Some of these concerns are:

- o Availability of a secure disposal area for excavated, contaminated soil.
- o Meeting all permitting requirements for hazardous waste temporary storage handling, transportation and disposal.
- o Meeting environmental or public health/safety liability concerns for the Town of Holden or MDC during the course of contaminated soil excavation, temporary storage, handling, transporation and disposal.

After these concerns are satisfactorily addressed, this alternative can be evaluated and screened. As with all other off-site remedial alternatives previously described, there are insufficient data at present to adequately evaluate this alternative. Remedial investigations would have to determine, as a minimum, the following information:

a. Location, depth and extent of off-site contaminated soil.
b. Identification of soil contaminants and levels of contamination.
c. Identification of suitable areas for temporary contaminated soil storage in preparation for removal, transportation and final secured disposal.

2.6.3.5 Combination of the Above Actions

Through the development of data, outlined in the off-site data requirement section, it may be possible to select a combination of two or more of the alternatives outlined above for implementaton. The selection of one or more actions would be based upon the results of the feasibility analysis.

2.7 DETAILED FEASIBILITY STUDY OF REMAINING OFF-SITE REMEDIAL ACTION(S)

All alternatives identified would be evaluated based upon technical feasibility (including impacts on human health), cost and environmental assessment. The results of the evaluation would provide the basis for the selection of the most appropriate remedial alternative after consideration of all pertinent factors.

The technical feasibility analysis would include the refinement and specification of each alternative with respect to engineering implementation and constructability. Specific attention would have to be given for the impact on human health and the safety of construction practices. Bench scale testing would confirm feasibility of treatment schemes identified and establish preliminary design criteria. Capital and operating costs would be developed and followed by a life cycle analysis to identify the most cost-effective alternative.

Finally, background information would have to be provided for base line data for the biota of the Holden Landfill Site and downgradient areas. From this information, an inventory of environmental issues would be established for those alternatives identified as both cost effective and technically feasible from the previous analysis. Measures to mitigate any adverse impacts identified would then be developed along with their respective costs.

2.8 DESIGN/IMPLEMENTATION OF SELECTED OFF-SITE REMEDIAL ACTION(s)

The remedial design would begin following the selection of the off-site remedial action(s) determined from the feasibility analysis. Detailed design specifications and contract documents would be developed for use by a construction contractor. Cost estimates, project scoping, and detailed scheduling of the remedial design would be developed at the time of the design consultant is engaged.

SECTION 3. REMEDIAL ACTION MASTER PLAN

3.1 INTRODUCTION

The major objective of the remedial investigation work plan is to provide sufficient data to evaluate and screen remedial action alternatives both on and off site, as identified in Sections 2.5 and 2.6 respectively. Data will be developed to establish the extent of contamination in the vicinity of the Holden Landfill and to identify the pathways for contaminant migration. Data developed in the remedial investigation work plan may also be used for the feasibility study.

3.2 SAFETY PLAN

Prior to commencement of any field investigation or remedial work at the Holden Landfill site, a site safety plan must be prepared to provide worker safety for all site work conditions and field emergencies. A site safety plan, developed for previous preliminary field reconnaisance work at the Holden Landfill, will serve as a guide for a complete safety plan for future remedial investigation and implementation work at the site. (Appendix A). The final plan will depend upon a review of available analytical data plus any site specific hazards (i.e. location of buried wastes.)

Because of the hazardous nature of the materials which may have been or are stored or disposed of on site, all personnel employed or retained for services at the Holden Landfill site may be required to wear personal protective clothing and respiratory protective equipment while working on and off site. Determination of the need for respiratory protection should be made on a location-to-location basis. Whenever a respiratory hazard is found to exist, the use of an air-purifying mask with cartridges or, in some cases, the use of a self-contained breathing apparatus may be required to protect workers from organic vapors in the ambient air. Other protective equipment which may be required includes chemically resistant coveralls, rubber overshoes, steel-toed safety boots, hardhats, rubber gloves and safety goggles. A review of safety services (i.e. fire, police, and hospital locations, and availability of emergency evacuation facilities) should also be performed. Development of a safety plan for the Holden Landfill site will require an effort of 1 man-week at $35/hr.

Routine air monitoring to characterize ambient air conditions should be conducted continuously on site with field measurements to establish worker safety when on-site.

3.3 SAMPLING PROTOCOL/QUALITY CONTROL PLAN

Sampling protocol and quality control guidelines, consistent with U.S. EPA guidelines, should be developed and implemented at the Holden Landfill site for all analytical and sampling activities. The primary objectives of the site specific guidelines are to obtain information for scientific and legal purposes, and which have the requisite levels of precision and accuracy to be used to make decisions concerning the control, removal, or management of hazardous wastes or enforcement actions. This will require that planning, sampling, analysis and data compilation be conducted in accordance with a well defined set of procedures.

The sampling and analysis protocol will identify the number, types, specific sampling, preservation, and analytical techniques, transportation, chain-of-custody, lab scheduling, and safety procedures to be used routinely for all field activities. Specific detailed written sample collections and chain-of-custody procedures should be consistent with procedures listed in "Enforcement Considerations for Evaluation of Uncontrolled Hazardous Waste Disposal Sites by Contractors" (EPA/NEIC April 1980), so as to insure the quality of data collected.

The types of samples which need to be collected at the Holden Landfill include both groundwater and surface water samples. Safety procedures for sampling groundwater wells may include protective clothing and equipment described in the site safety plan as well as measures described in the following well sampling procedure.

1. The static volume of each well should be determined by measuring the static water level and sounding the depth of the well.
2. A total of between five to ten times each well's static volume should be purged from the well by using a centrifugal suction pump. The purged water should be placed in containers.
3. The volume of sample required for each laboratory analysis should be obtained by using a stainless steel bailer attached to a monofilament line. The volume of sample collected and types of containers used is dependent on the analysis to be performed. The following volumes should be collected except at wells where duplicate samples are obtained and where concentrated samples are obtained:

   Two - Half-gallon glass bottles: Extactable organic analysis

   One - One-liter polyethylene bottle: Metals analysis

   Two - Forty-four milliliter septum vials: Purgeable organic analysis
4. The stainless steel bailer and intake hose of the pump should be thoroughly rinsed in methanol followed by water to avoid cross-contamination. New monofilament line should be used at each well.

5. All samples should be handled, preserved and documented per EPA National Enforcement Investigations Center (NEIC) specifications.
6. All purged water containerized before obtaining each sample should be poured back down the well.

When extremely high levels of volatile organic compounds are detected, samples should be sent to the regulated laboratory at the EPA/NEIC in Denver, Colorado for dilution prior to analysis.

When collecting surface water samples, care should be taken so that direct contact does not occur and the sample bottle is rinsed free of outside contamination so that further handling will not create a worker safety hazard. Special provisions must be made to sample lagoons or tanks where access may be difficult.

3.4 REMEDIAL STUDIES FOR THE NO ACTION ALTERNATIVE

Specific data are needed to evaluate the present impact of the contaminated surface water drainage (in the vicinity of the Holden landfill) into the Quinapoxet River, the Wachusett Reservoir and the MDC Water System. Data on water flow and quality will characterize field conditions. After the development of water quality goals for the Wachusett Reservoir, based upon State and Federal drinking water standards, the data will be analyzed. The evaluation of the no action alternative will establish the need for implementation of further remedial actions.

There are two processes at work serving to reduce the impact of contaminants on the water supply system. Contaminated surface drainage is diluted many fold as it flows into the Quinapoxet River and the Wachusett Reservoir. In addition, the Quinapoxet River provides a medium for the reduction of organics as they react and/or volatilize with the River's dissolved oxygen.

Assessment of the no action alternative requires consideration for seasonal variations and the resulting impact on the flow and concentration of contaminated surface water drainage, in conjunction with the surface water quality and flow/volume in the Quinapoxet River and Wachusett Reservoir, respectively. The data collected should establish quality and flow conditions for extreme events likely to produce higher concentrations of contamination and thus eliminate the no action alternative. Four data sets will be collected monthly beginning in April, when high flows typically occur, and end with July, a month when flows are typically lower. After developing the data to account for seasonal variations, the analysis will be performed using extreme conditions for the critical cases identified.

The effect of contaminant dilution can be evaluated from monthly sampling for priority pollutants at twelve locations over the four month period from April through July and the development of low volume information. Three sample locations will be established in the Washusett Reservoir and sampled at three different depths. Two sampling locations will be established for the Quinapoxet River, one upstream and one downstream of the confluence of the contaminated surface water drainage. The final sampling point will be at the contaminated surface water drainage stream just before entering the Quinapoxet River. Similarly, flow information will have to be established for the contaminated surface drainage and River. A sharp crested weir may be used to measure the flow in the contaminated surface drainage stream. Flow measurements of the Quinapoxet

River may be readily available using established gage stations. The volume of water stored in the Wachusett Reservoir can be determined from area/capacity curve information from the MDC.

Utilizing the data collected, an initial evaluation will be performed determining the anticipated concentration of contaminants in the Wachusett Reservoir and comparing the model prediction with the actual reservoir sample results. The model may be more fully explained by assessing the treatment ability of the Quinapoxet River, by quantifying the River's dissolved oxygen capacity. Additional parameters necessary to evaluate the oxidation of organics include the temperature and surface area of the Quinapoxet River. Using this information in conjunction with the data developed previously, the water quality in the Wachusett Reservoir can be predicted better under the spring and summer conditions. The results of the data analysis will be compared to the water quality goals and will serve as a basis for evaluating the no action alternative.

3.5 CHARACTERIZATION OF WASTE/CONTAMINANT SOURCE(S) ON-SITE AND OFF-SITE

Characterization of the Holden Landfill site will provide necessary data to develop and screen alternatives for remedial action. Data are needed to characterize industrial wastes on site and contaminated soils both on site and off site to evaluate the alternatives. Information on site groundwater conditions needed to provide input for alternative evaluation are discussed in Section 3.7.

In order to identify locations and quantities of known industrial contaminants which have been either deposited, buried and/or incinerated at the Holden Landfill the following procedure has been outlined:

1. Review all records on the development of the landfill in conjunction with information on known industries who have disposed of wastes at the landfill. Use information collected to establish areas of known industrial waste disposal and to develop an inventory of waste types.
2. Develop a map of the landfill depicting information developed in Step 1 using the available topographic maps, on the areal extent of industrial waste deposition. Use bedrock contour data, available from previous geophysical field work (Section 3.6), to refine volume estimates made in Step 1.
3. Perform 6 to 10 soil borings (up to 100 feet deep) to characterize the type, concentration and vertical extent of contamination. Test pits could be used in conjunction with soil borings to further locate extent of contamination. Use the map developed in Step 2 to establish soil boring locations. The determination of the depth to undisturbed soil interface as well as qualitative screening of soil brings in the field, will provide the necessary information to refine the industrial waste inventory and provide input for the remedial action alternatives.

Two other areas of possible contaminated soil include an area 500 feet northwest of the Holden Landfill Building at the top of a ridge, identified by an open metal tub, and the stream bed of the contaminated surface drainage stream

north of the site which eventually flows into the Quinapoxet River. The area identified by the metal tub may have been used for burning off liquids and appears to have stained soil in the vicinity. Hand augering followed by OVA screening for both areas will establish the need and extent of contaminated soil removal at both sites. This information will similarly be used to evaluate and screen the remedial action alternatives.

3.6 Interpretation of Data Obtained From Previous Geophysical Field Work

As discussed in Section 1.3.4, Previous FIT Investigations, E & E has undertaken and supervised two geophysical studies on and off site. The purposes of these geophysical studies were to detect any groundwater contaminant plumes and to provide data on water table and bedrock depths and any other discernable stratigraphic features. These data would then be used to develop groundwater and bedrock contour maps for the landfill site area (on and off site). These contour maps would then provide the necessary information to develop a groundwater monitoring well program including number location, depths, and types of groundwater monitoring wells.

3.6.1 Description of Previous Geophysical Field Studies

The first geophysical study undertaken by E & E was an electrical resistivity survey (ER) of the landfill site. The apparent resistivity data generated by an ER survey can be relied upon to quallitatively reflect the general types of subsurface materials. However, determinations of precise depths and thicknesses of subsurface

materials should not be based solely on resistivity data since surface and subsurface conditions can create irregularities and/or inaccuracies in the quantitative interpretation of resistivity data. Therefore, ER surveys are usually performed in conjunction with at least one other subsurface investigation technique in order to correlate subsurface data. In this case, a seismic refraction survey was also performed over the same area as the ER survey in order to complement the ER data. The resulting combined data will provide a more accurate representation of subsurface characteristics.

The methodology for the Holden ER survey was developed with regard to the type of data that was required and the anticipated surface/subsurface interferences. A survey consisting of a series of electrical soundings and horizontal profiling was performed in order to establish upgradient and downgradient hydrogeologic data and were placed in series to obtain continuous lines of ER data. Electrical sounding, provides vertical subsurface data, and horizontal profiling, provides horizontal (lateral variation) data. A majority of the survey lines were concentrated at assumed downgradient locations from the landfill in order to delineate the contaminant plume. The survey consisted of 35 electrical soundings and 40 horizontal profilings for a total of 75 ER lines. A majority of the soundings were completed before the profilings in order to determine vertical subsurface data (depth to groundwater and bedrock, etc.) over a large area. As a result, the profilings were conducted more efficiently at the particular depth of interest since approximate depths of changes in strata had already been determined.

Particular electrode spacings were chosen for each ER line based on the location of the line and the predicted depths of strata charges for that location. Approximately 5200 linear feet of soundings were conducted along 35 lines. The electrode positioning for each line was at intervals of either five or ten feet to a maximum electrode spacing of 150 feet. A maximum spacing of 150 feet was used since the maximum depth to bedrock was not expected to be greater than 100 feet. The 40 horizontal profiles, consisting of 1000 linear feet of surveying, were performed at various electrode spacings of multiples of five feet to a maximum electrode spacing of 100 feet.

The results of the ER survey study consist of resistivity values at various electrode positions for each profile or sounding ER line. These raw data have not been further reduced, analyzed or evaluated.

The Seismic Refraction (SR) study for the Holden Landfill was subcontracted by E & E to Weston Geophysical Corporation (WGC) of Westboro, Massachusetts. The SR study was undertaken in order to complement and support the ER study data and any future analysis of the ER data. As previously explained in more detail, SR is a subsurface geophysical technique which produces a seismic wave via a small buried explosive charge and then measures the time required for this wave to travel through the ground and back to a series of vibration-sensitive devices or geophones. The geophones are spaced at predetermined intervals along a straight line on the ground surface. The data produced from this survey allows for an interpretation of the depths to various refracting horizons (bedrock, glacial fill,

groundwater etc.). The Holden SR study consisted of 8200 linear feet of SR spread lines and 368 SR survey stations, all located at the approximate locations of the ER survey work.

The raw data for the SR study was reduced, plotted and analyzed by WGC. Profiles of all completed SR lines which show the locations of each seismic station and major seismic velocity changes have been completed. Elevations and locations of all seismic stations were plotted on a topographic base map to enable the development of groundwater and bedrock contour maps.

3.6.2 Remedial Investigation Work Plan for the Geophysical Studies

As previously explained under the data requirements section, in order for evaluation of both source control and off-site remedial actions, the following information must be generated from the geophysical field work:

1. Groundwater flow patterns for the site area
2. Bedrock contours for the site area
3. Presence of impermeable soil layers (i.e. dense glacial fill on site, particularly in the vicinity of potential waste sources.

No further field work is necessary to obtain information from the site area regarding the above data requirements. In addition, the SR data has been fully analyzed and is graphically presented. However, the ER survey data has not been reduced or analyzed. These data must be analyzed and transcribed into a presentable format for comparison purposes and to support conclusions reached from the SR study. After analysis of the ER data and interpretation of

both sets of data, groundwater and bedrock contour maps may be drawn up for the site area with particular emphasis for those on-site areas where wastes may be buried. It should require approximately four to six man-weeks to analyze the ER data, two man-weeks to graphically plot the ER data and an additional two manweeks to draw up the bedrock and groundwater contour maps based on all the combined geophisical data.

3.7 INSTALLATION/SAMPLING/ANALYSIS OF GROUNDWATER MONITORING WELLS

Interception and treatment of contaminated groundwater will be evaluated as a remedial action for both source control and off-site groundwater contamination. However, there is insufficient data to make this evaluation. The lateral and vertical extent of contaminated groundwater must be established both on site and off site. The extent of contaminated groundwater in both overburden and bedrock aquifers must be considered. Groundwater contaminants must also be identified and quantified.

E & E recommends that groundwater monitoring wells be installed as part of the remedial investigation work plan in order to develop this required data. The interpretation of data from the completed geophysical studies will determine the groundwater flow patterns and direction(s), and bedrock depths. This information can then be used to determine the number, location and depths of groundwater monitoring wells to be installed.

The groundwater monitoring well system should therefore be installed as soon as possible to permit sampling and analyses of the

groundwater. E & E recommends that the existing geophysical studies results be therefore evaluated in a fast-track mode which would include the development of the groundwater monitoring program.

The following assumptions will be made for purposes of estimating costs and scheduling for installation of groundwater monitoring wells as part of this RAMP (Section 4.0). These assumptions are as follows:

1. Bedrock aquifer contamination does not exist on site.
2. Bedrock depths vary from 20 feet to 100 feet across the site area with an average depth of 60 feet.
3. The six shallow penetration groundwater monitoring wells in the site area will be replaced with six new monitoring wells extending to bedrock.
4. There will be four background groundwater monitoring wells installed to bedrock and located east, southeast, southwest and west from the landfill area on site.
5. An additional five groundwater monitoring wells extending to bedrock will be placed north of the landfill off site which will delineate the lateral off-site extent of any overburden groundwater contamination plume. The exact location of these wells can only be determined after the data from the geophysical field studies have been reduced and analyzed.
6. The installation of these 15 groundwater monitoring wells will take one month.

Sampling and analysis of the groundwater monitoring wells should be conducted in order to characterize the contaminants in the groundwater plume which might require extraction and treatment. E & E proposes sampling of installed groundwater monitoring wells over a four-month period (April-July) in order to determine seasonal variations in contaminant behavior. Sampling should be performed once per month over this four month period. Sampling over a time period in excess of four months would provide additional data, however, it would also delay the screening and evaluation of proposed remedial alternatives. Groundwater samples from all groundwater monitoring wells (estimate of 15) should be analyzed for all priority pollutants. Analytical results may not be received for 30 to 45 days after delivery of the samples to the testing laboratory.

All monitoring well casing should be PVC with a nominal diameter of one and one-half inches and extend two and one-half feet above ground level. The pipe should also have threaded flush joints, no solvents used as joining compounds and be equivalent to Schedule 80 ASTM standards. The casing should terminate in a factory-slotted PVC well screen with a slot size of 0.010 inches. It is recommended that caps of the same material as the well screen be threaded on to the bottom of each well screen to prevent the intrusion of filter material. During monitoring well construction, the annular space surrounding the wells should be backfilled with a suitable grade of Ottawa sand or similar medium-grain clean sand to a level approximately one foot above the top of the screen.

In order to provide well security, a three-inch nominal diameter steel casing, five feet in length should be placed around the PVC casing and set into a two foot depth of concrete. E & E recommends that the top of the steel casing extend above the inner casing and be fitted with a secured cap.

E & E also suggests that representative samples of soil be obtained at every change of stratum and at intervals not exceeding five feet, using a one and one-half inch diameter split-spoon sampler.

The split-spoon sampler should be cleaned before each sample is taken. This cleaning process consists of initially rinsing the split-spoon sampler with clean wash water, then with methanol, and finally with water. Furthermore, prior to the mobilization of the drill rig on site and after each well installation, the rig and all associated equipment must be thoroughly cleaned to remove all contaminants, grease, mud, tar, etc. This cleaning process similar to the one described above consists of 1) high-pressure hot-water cleaning of the drilling equipment 2) rinsing the equipment with methanol, and 3) a high-pressure hot-water final rinse.

4.0 Schedule and Cost Estimates of Remedial Planning Activities

4.1 Project Coordination/Community Relations Plan

Project coordination, as described in Section 2.2 of the RAMP, will be continuous throughout the duration of the entire remedial action program. EPA has previously estimated the direct manpower costs of project coordination for hazardous waste site remedial actions to be $51,000 and this figure will be used for budgeting purposes for the Holden Landfill RAMP.

The community relations plan, as described in Section 2.3 of the RAMP, is developed during the initial stages of a RAMP. It is implemented and proceeds concurrently with the overall site cleanup process. EPA has previously estimated the cost at $10,000 which includes approximately 250 man hours for EPA and Commonwealth of Massachusetts personnel. These personnel would coordinate at least three public meetings during the course of remedial planning and action as well as other items such as informational mailings and press releases.

The schedule and cost estimates for these aspects of the RAMP are summarized in Table 1.

4.2 Initial Remedial Actions

Initial Remedial Actions (IRA), as described in Section 2.4 of the RAMP, require a minimum of planning, are implemented during the initial stages of the RAMP, and are performed separately from the remainder of the RAMP tasks.

One specific IRA previously described includes sampling and analysis of twenty-three groundwater wells in Holden and West Boylston. Samples obtained from all these wells would undergo volatile organic analysis by GC/MS. Sampling would require two days and the sampling cost would range from $800 to $950. The cost for analysis of all samples would range from $4,600 to $5,400. For scheduling purposes, results from sample analysis may not be available for four to six weeks after sampling.

The other IRA pertains to site security and includes the installation of a fence and warning signs at the off-site contaminated surface water location. Installation of the 1200-foot fence and twelve warning signs

TABLE 1

SUMMARY OF REMEDIAL ACTION PROJECTS

SCHEDULE AND COST ESTIMATES

PROJECT	SCHEDULE[1]	PERFORMED BY	ESTIMATED COST[2]
Project Coordination	Continuous	Commonweath of Mass.	$51,000
Community Relations Plan	Continuous	Commonweath of Mass.	$10,000
Initial Remedial Actions	4 - 6	Subcontractor	$16,400 - 19,350
Remedial Investigation Work Plan	57 - 62	Consultant/ Subcontractor	$170,800 - 222,500
Feasibility Study	10 - 12	Consultant	$ 89,000 - 110,000
Remedial Design	--	Consultant	--
Implementation of Remedial Actions	--	Consultant/ Subcontractor	--
Long-Term Monitoring	--	Commonweath of Mass.	--
TOTAL			$337,200 - 412,850

Notes:

(1) Duration in weeks required to complete each project.

(2) Cost estimate ranges in dollars to complete each work item.

attached to the fence would cost $11,000 to $13,000 including materials and would require five days for installation.

The total cost range for all IRA's is $16,400 to $19,350 with an overall time schedule of four to six weeks for final completion.

4.3 Remedial Investigation

The costs and schedule included in this section cover all Remedial Investigations (RI) as described in Section 3.0 Remedial Investigation Work Plan which are necessary for evaluation and screening of source control and off-site remedial actions.

The first RI involves the development of a site safety plan which would cover any and all field or remedial work on and off site. The development of a site safety plan after review of existing site safety plans, analytical data, available safety services and site specific hazards, will require approximately one man-week and cost $1,200 to $1,500.

Implementation of a groundwater/surface water sampling protocol and quality control plan is an important RI for all samples collected for scientific and legal purposes. The implementation of the sampling protocol and maintenance of a quality control plan as described in Section 3.3 would take between six and eight man-weeks over the duration of all RI's for the Holden Landfill site. It is assumed that experienced staff personnel are available to oversee the implementation and maintenance which will cost $8,400 to $11,200.

Remedial studies for a no action remedial alternative are discussed in detail in Section 3.4 of the RAMP. These studies would gather enough data in order to evaluate any environmental/public health impacts from the contaminated off-site surface water drainage. Analytical data on water quality must be determined by sampling twelve surface water locations as described in Section 3.4. These twelve locations must be sampled once every four weeks over a 16-week period. Analysis of the last batch of samples will require an additional four to six weeks for a total duration of 20 to 22 weeks. Analysis of the 48 water samples for volatile organics by GC/MS will cost approximately $9,600 to $11,500. Additional data gathering, flow monitoring, estimation of contaminated surface water drainage flow, data evaluation and report preparation all will require approximately 560

man-hours at a cost of $19,600 to $23,500. The majority of this work can be performed concurrently with the surface water sampling and analysis except for the final data evaluation and report preparation which would require an additional two weeks. The total cost of this RI is $29,200 to $35,000 with a total duration of 22 to 24 weeks.

Characterization of waste contaminant sources is an important RI which requires several actions as described in Section 3.5. Performance of an industrial waste survey and site waste mapping will require three to four man-weeks and cost $4,200 to $5,600. The soil borings (six to ten borings to an average depth of 60 feet) will cost approximately $23,000 to $38,000 for all drilling and soil boring including contractor supervision by a consultant. The soil boring will take approximately two man-weeks with an additional two man-weeks for drilling contractor selection. The total cost of this RI is $27,200 to $43,600 and the time estimate is seven to eight weeks.

Interpretation of data obtained from the two previous geophysical studies (ER and SR) will involve data reduction, analysis, and evaluation. It will also include the development of groundwater and bedrock contour maps. E&E estimates that approximately 380 man-hours would be required to perform this work and will cost $9,800 to $11,200. For scheduling purposes, this work could be completed in four weeks.

Installation/sampling/analysis of the proposed groundwater monitoring wells is a major work item under the RI. The exact nature of the proposed groundwater monitoring well program will not be known until the previous geophysical studies have been fully interpreted. Therefore, the costs involved in this discussion are strictly estimated based on an assumed fifteen well installation program. The exact and final number of groundwater monitoring wells may vary considerably from this number. The costs for drilling and installing fifteen overburden groundwater monitoring wells (based on the assumptions in Section 3.7) is $45,000 to $60,000 and includes all labor, consultant supervision and development of the groundwater monitoring well program. Sampling and analysis of the installed wells over a four month period will cost $50,000 to $60,000. This figure includes sampling all fifteen wells once per month over a four-month period.

Analysis would be conducted for all priority pollutants for all samples collected. The time estimate for all the above work would be 28 to 30 weeks. This includes four weeks for development of a monitoring well program and selection of a drilling subcontractor, four weeks for monitoring well installation, 16 weeks for sampling and four to six weeks for final sample analysis. The total cost for the installation/sampling/analysis of groundwater monitoring wells would be $95,000 to $120,000.

Table 2 presents a summary of all costs and time estimates for the Remedial Investigations as described in this section. The total estimated cost for the RI ranges from $170,800 to $222,500. Investigation work Items 1, 2, 4 and 5 (see Table 2) can be performed simultaneously requiring an estimated duration of seven to eight weeks. Item 3 can proceed after the above items are completed and this would require 22 to 24 weeks. If the no action alternative is selected after the RI, there is no need to proceed on with the final Item 6. However, if the no action alternative is not favorably evaluated or selected, Item 6 should then be performed requiring an additional 28 to 30 weeks for a total duration of 57 to 62 weeks. The project coordinator could also choose to proceed with work Items 3 and 6 simultaneously which would reduce the entire RI schedule to 35 to 38 weeks duration.

4.4 Feasibility Studies for Source Control and Off-Site Remedial Actions

Feasibility Studies are conducted after the completion of the Remedial Investigation Work Plan and the preliminary evalution of remedial action alternatives. Further discussions of the feasibility studies are included in Section 2.5.4. The following studies have been identified and are discussed below with respect to their respective estimated cost and schedules:

-Aquifer Pump Tests

-Benchscale Treatment Tests

-Environmental Impact Assessment

-Site Drainage Plan

TABLE 2

SUMMARY OF REMEDIAL INVESTIGATIONS

SCHEDULE AND COST ESTIMATES

	INVESTIGATION	SCHEDULE[1]	ESTIMATED COST[2]
1.	Site Safety Plan	1	$ 1,020 - 1,500
2.	Sampling Protocol/Quality Control Plan	6 - 8	$ 8,400 - 11,200
3.	No Action Alternative	22 - 24	$29,200 - 35,000
4.	Characterization of Waste Contaminant Sources	7 - 8	$27,200 - 43,600
5.	Geophysical Field Work Data Interpretation	4	$ 9,800 - 11,200
6.	Installation/Sampling/ Analysis of Groundwater Monitoring Wells	28 - 30	$95,000 - 120,000
	TOTAL		$170,800 - 222,500

Notes:

(1) Level of effort in man-weeks to complete each work item.

(2) Cost estimate ranges in dollars to complete each work item.

4.4.1 Aquifer Pump Tests

Two overburden aquifer pump tests, one on-site and one down-gradient off-site, should be performed for evaluating the groundwater removal and treatment options. A six or eight inch diameter overburden aquifer pump test well should be drilled and loctaed at a depth of up to 60 feet (assumed average bedrock depth). As discussed in Section 3.8, it has been assumed that no bedrock aquifer contamination problem exists.

The aquifer pump test in each well should be conducted for 12 to 24 hours to determine the transmissivity, permeability, and drawdown of the overburden and bedrock aquifers. The groundwater that is pumped out of the ground should be impounded, treated, and/or recharged to the aquifer from which it was pumped. The resulting data would be used to evaluate the feasibility of groundwater removal via pumping, if necessary.

During the pump tests, groundwater samples should be collected hourly from each test well and analyzed by GC/MS for volatile organics. The resulting on-site groundwater quality data would be used to develop future groundwater treatability studies. Groundwater samples would be analyzed by a subcontracted laboratory at an estimated cost of $10,000 to $12,000 and would require four to six weeks to complete.

Approximately two weeks of field work would be required by a subcontractor to complete the well drilling and installation and pump testing with an estimated subcontractor cost of $40,000 to $42,000. The estimated consultant cost for the contract administration and field supervision is $5,000 to $6,000, resulting in an estimated total cost of $55,000 to $60,000. The total cost does not include groundwater impoundment, treatment, or recharge following pumping.

4.4.2 Benchscale Treatment Tests

Benchscale treatment tests should be performed on contaminated groundwater and surface waters to establish the feasibility of proposed treatment schemes. Actual benchscale treatment tests would be completed in a two-week period if coordinated with the other field studies to derive maximum benefit of baseline data collection and minimize analytical costs. Characterization of waste types, establishment of specific treatment options and evaluation of benchscale testing data must be completed. This work

will require four to six man-weeks to complete if baseline data necessary for Sections 3.5 and 4.4.1 are jointly developed and coordinated. The total effort is estimated, therefore, to take six to eight man-weeks and cost $20,000 to $30,000.

4.4.3 Environmental Impact Assessment

During the feasibility phase of work baseline biota data will have to be collected, environmental issues will have to be identified, and measures to mitigate any adverse impacts of the remedial actions will have to be addressed. Specific steps for the completion of the environmental impact assessment include the following:

- -Identify any ecologically sensitive environments (ie. endangered species) for baseline biota data.
- -Identify and evaluate impact of remedial action(s) being considered on baseline biota data.
- -Determine required mitigation actions to incorporate in the design/construction phase of remedial action implementation.
- -Submit "report" to community relations plan coordinators for public input and "report" finalization.

It is estimated tht the environmental impact assessment would require six to eight man-weeks of effort, take up to two months to complete and cost $10,000 to $15,000.

4.4.4 Site Drainage Plan

The disturbance of the site during implementation of remedial action(s) may result in the exposure of contaminated soils and water. During rainfall events these contaminants may be washed off the surface. This site runoff must be controlled if further contamination of the local surface and groundwater is to be avoided.

Site drainage plans should be developed based upon available topographical maps and remedial alternatives identified. The plans should be developed for existing conditions and for the period during remedial actions. The purpose of the plan will be to ensure minimal risk of runoff during the implementation of remedial actions. Consideration will have to be given for temporary storage of any excavated contaminated solid waste

generated from site activities. Available topographic maps will serve as a basis for design layout decisions for minimizing runnoff and containing liquids generated. The preparation of drainage plans will involve an evaluation of surface transient drainage conditions during typical as well as extreme storm events (25-year storm).

It is estimated that the site drainage plan would require two to three man-weeks, take up to one month and cost $4,000 to $5,000 to complete.

The total cost estimated for the above feasibility studies ranges from $89,000 to $110,000 and is estimated to take ten to twelve weeks, provided that adequate man-power is available. Feasibility work Items 4.4.1, 4.4.3, and 4.4.4 could be conducted simultaneously. Item 4.4.2 could not be started until the completion of 4.4.1.

4.5 Design of Selected Remedial Action(s)

Following the feasibility study of the remedial action alternatives, the selection of the most cost-effective, feasible remedial action(s), and the determination of the appropriate extent of remedial action, the consultant will begin remedial design. The purpose of this remedial planning activity is to develop detailed design specifications and contract documents for the selected remedial action(s). The results of the remedial design will be used by a subcontractor to perform the recommended remedial actions(s) on and/or off the site. Cost estimates, project scoping and detailed scheduling of the remedial design would be developed at the time the design consultant is engaged and are therefore not presented in Table 1.

4.6 Implementation of Selected Remedial Action(s)

The purpose of this task is to implement the most cost-effective and feasible remedial action(s) recommended by the Commonwealth of Massachusetts and EPA. Source control and/or off-site remedial action should be implemented according to specifications and contract documents developed during remedial design. Cost estimates, project scoping, and detailed scheduling for remedial action implementation would be developed during the remedial design task by the design consultant.

4.7 Long-Term Monitoring

The purpose of this task is to establish an environmental monitoring program for implementation after completion of remedial actions. The type and extent of long-term monitoring that should be implemented depends upon the results of the remedial investigation and the type(s) of remedial action(s) implemented on and/or off site. It is envisioned that cost estimates, project scoping, and detailed scheduling would be developed for this task during the design phase by the design consultant.

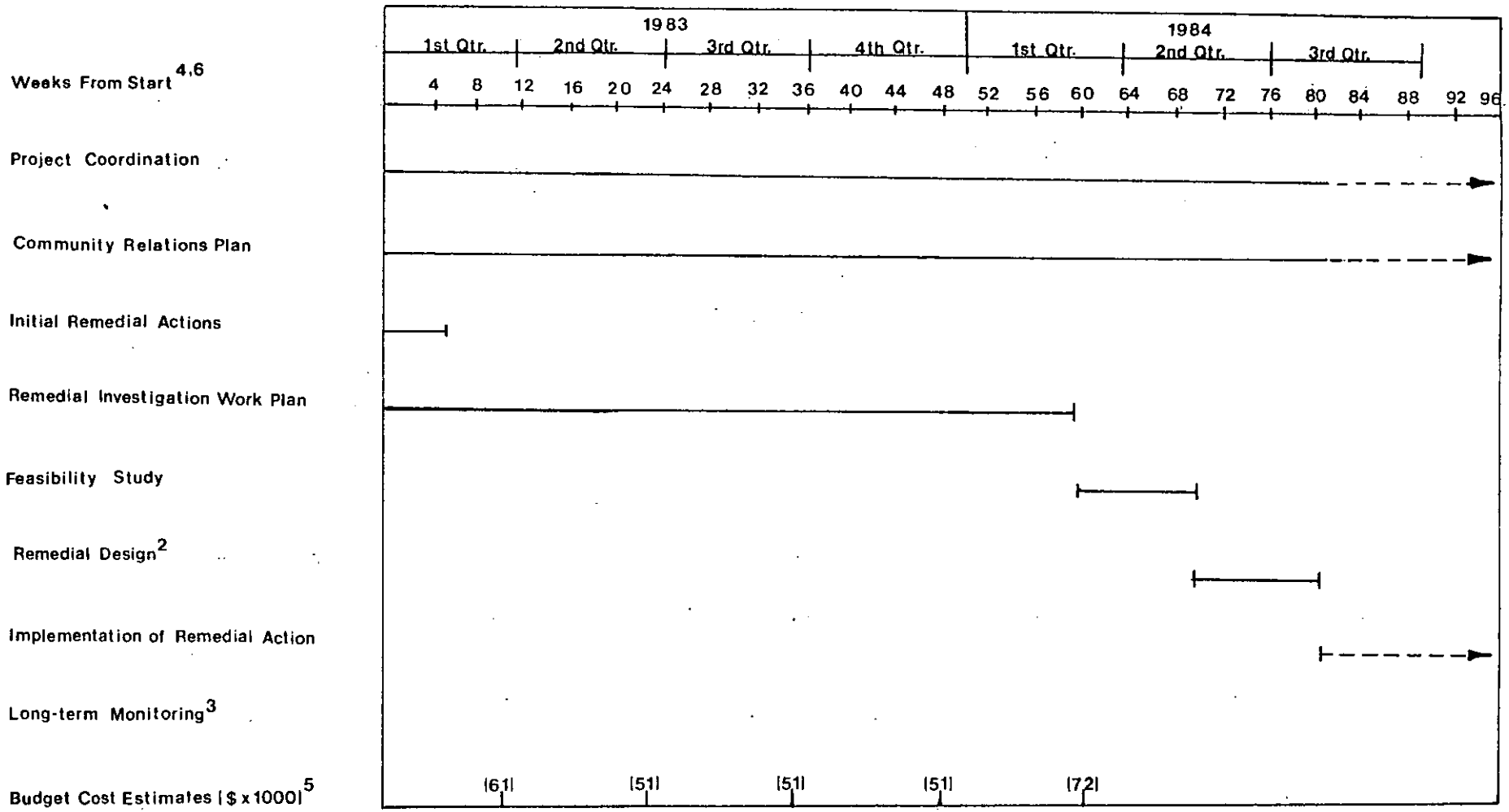
4.8 Schedule of Remedial Action

An overall schedule of remedial action for the Holden Landfill Site is presented in Figure 3. The schedule identifies the estimated amount of time required by the consultant and subcontractor to complete each remedial project. Definite schedules have not been provided for Design for Selected Remedial Action(s), Implementation of Selected Remedial Action(s), and Long-Term Monitoring since they are dependent on the results of the Remedial Investigation(s) and the Feasibility Study.

The time requirement estimated for each remedial project is based on data contained in other remedial planning documents produced for EPA and on best engineering judgement. The schedule includes all in-house and field activities by the consultant and subcontractor and incorporates a one month State and Federal review period following the remedial projects completed by the consultant. Figure 3 was developed in consideration of the following assumptions:

1. A five-day, 40-hour work week for consultant and subcontractor.

FIGURE 3[1]. REMEDIAL ACTION SCHEDULE



1 assume no weather delays in schedule.

2 assume 3 month design period solely for purposes of graphical display.

3 schedule of long-term monitoring would be determined during remedial design and implementation phase.

4 schedule time estimates from Table 1 have been averaged.

5 estimated costs from Table 1 have been averaged.

6 assume starting date of January 17, 1983 for remedial action schedule.

2. Each remedial project must be completed in full before a subsequent project can commence with the exception of the Community Relations Plan, Project Coordination, and Initial Remedial Actions.
3. Adequate manpower and financial resources are available to conduct some of the remedial work concurrently.
4. The consultant has required expertise and ability for this type of hazardous waste work.

APPENDIX A - SITE SAFETY PLANS

HOLDEN LANDFILL

APPROVED DATE	OBJECTIVE
14 December 1981	Perform site investigation with sampling.
16 March 1982	Perform land survey.
13 October 1982	Perform a seismic refraction study.

ECOLOGY AND ENVIRONMENT, INC.
FIELD INVESTIGATION TEAM - REGION 1
SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Holden Landfill TDD NO: F1-8112-01
WSTS NO:
LOCATION: Holden, Massachusetts
PLAN PREPARED BY: Anne Marie Desamarais DATE: Oct. 13, 1982
APPROVED BY: A M Desmarais DATE: Oct 13, 1982
OBJECTIVE(S): To perform a seismic refraction study.

PROPOSED DATE OF INVESTIGATION: October 20, 1982
BACKGROUND REVIEW: Complete: X Preliminary:
DOCUMENTATION/SUMMARY: OVERALL HAZARD: Serious: Moderate:
Low: X Unknown:

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES(S): Liquid X Solid X Sludge X Gas
CHARACTERISTIC(S): Corrosive Ignitable Radioactive
Volatile X Toxic Reactive Unknown Other (Name)
FACILITY DESCRIPTION: 80-acre landfill

Principal Disposal Method (type and lotation): landfilling

Unusual Features (dike integrity, power lines, terrain, etc):
Overhead power lines.
Status: (active, inactive, unknown) Operating municipal landfill
History: (Worker or non-worker injury; complaints from public; previous agency action): Town landfill near river which feeds into MDC reservoir. Leachate has been observed at the site. Leachate analysis did not indicate presence of priority pollutants.

3.2

C. HAZARD EVALUATION

Low level volatiles (<20 ppb) have been detected on site. Foul odors associated with decoying organic material are present.

Low hazard. Level D may be used on the site. Upgrade to Level C if odors are present.

D. SITE SAFETY WORK PLAN

PERIMETER ESTABLISHMENT: Map/Sketch Attached X Site Secured: X
Perimeter identified? X Zone(s) of Contamination Identified? X

PERSONAL PROTECTION

Level of Protection: A ____ B ____ C X D X
Modification: Tyveks not required

Surveillance Equipment and Materials: TLD badge

DECONTAMINATION PROCEDURES: Boot wash.

Special Equipment, Facilities, or Procedures:

SITE ENTRY PROCEDURES: Per Town permission.

Team Member	Responsibility
Chris Hagger	Project Leader
Richard DiNitto	Site Entry Leader/Geologist
Margret Hanley	Geologist/Safety
Western Geophysical Corp.	Seismic Contractor

WORK LIMITATIONS (time of day, etc.):

INVESTIGATION DERIVED MATERIAL DISPOSAL:

Site: Holden Landfill TDD #: F1-8112-01 Date: 10/20/82

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance Holden Police 829-3333
Hospital Emergency Room University of Mass. Medical Center, Worcester, 856-0011
Poison Control Center 1-800-682-9211
Police Holden 829-3333
Fire Department Holden 829-4411
Airport N/A
Explosives Unit Massachusetts State Police 829-4431
EPA Contact John Hackler 223-5708

SITE RESOURCES

Water Supply Supplied by FIT
Telephone
Radio
Other Allen Berg, Town Engineer, Holden, MA 829-6561

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (University of Arkansas). . (501) 661-5766 or 661-5767
   (501) 370-8263 (24 hour)
2. Anne Marie Desmarais . . . . . (617) 897-5306
3. Robert Young . . . . . (617) 545-4905
4. FIT office . . . . . (617) 935-0228
5. Ecology and Environment, Inc. NPMO . . . . . (703) 522-6065
   (24 hour; call forwarding)
6. Dr. Robert Wainer - Norwood Industrial Medicine (617) 762-0209
   60 Guild Street
   Norwood, MA 02062

Site: Holden Landfill TDD #: F1-8112-01 Date: 10/20/82

F. EMERGENCY ROUTES

(Give road or other directions; attach map)

HOSPITAL: University of Massachusetts Medical Center; Route 12 South to Route 9 East. Medical Center is located on Route 9 at Lake Quinsigamond.

OTHER: Directions to site: Route 90 West to Auburn Exit. Route 290 North to Route 190 North.

ECOLOGY AND ENVIRONMENT, I

FIELD INVESTIGATION PLAN - REGION 1

SITE SAFETY PLAN SUMMARY

SITE: Holden Sanitary Landfill DATE: 12/14/81

TDD #: F1-8109-04

Location of site: Holden, MA

Directions to site: Holden, MA

Project Leader/Site Entry Leader: Christopher Hagger

Safety Person: William Norman

Equipment Person: Keith Brown

Work Party: Chris Hagger, Keith Brown

Reason for Site Entry: To perform a site investigation and sampling of surface water.

Special Hazards: None

Hazard Assessment: (H, M, L, Unk.) Low to Medium

Level of Protection: Level C, Level D

Required Protective Equipment:

1. ultra-twin with GMC-H
2. rubber gloves
3. rubber boots
4. field clothes
5. tyveks (optional)
6. TLD badge
7. disposable gloves
8.
9.
10.

FIELD INVESTIGATION PLAN - [redacted]ION 1

SITE SAFETY PLAN

[redacted]TE: Holden Landfill DATE: 12/7/81 TDD # F1-8109-04

LOCATION: Holden, MA PREPARED BY: Lori J. Fucarile

INVESTIGATIVE OBJECTIVE(S): To perform a site investigation and sample surface water on site and off site PROPOSED DATE OF INVESTIGATION: 12/14/81

BACKGROUND REVIEW: Complete: X Preliminary: ____

DOCUMENTATION/SUMMARY: OVERALL HAZARD: Serious: ____ Moderate: X Low: X Unk: ____

SITE/WASTE CHARACTERISTICS

WASTE TYPE(S): Liqiud X Solid X Sludge X Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____ Volatile ____ Toxic ____ React. ____ Unk. X

FACILITY DESCRIPTION: Size: >80 acres Buildings: garage

Topography: Relief is moderate to extreme

Principal Disposal Method (type and location): landfill, tank, lagoon.

Unusual Features (dike integrity, power lines, terrain, etc.) old power lines off site interstate highway roadbed abuts site Status: (open, closed, unknown) open

HISTORY: (worker or non-worker injury; complaints from public; previous agency action):
The landfill began in 1960. Industrial wastes were dumped at the site. Groundwater contamination and leachate are entering into the Quinapoxet River.

HAZARD EVALUATION

Low to Moderate Hazard. Low Hazard during off-site sampling of Quinapoxet River and Wachusett Reservoir. Level D while sampling these surface water areas. TLD badge, field clothes, rubber gloves.

Moderate Hazard during sampling of lagoon area located under an old power line approximately 100 yards upstream of two leachate streams. Vinyl chloride was detected at 17 ppb. Level C while sampling any surface water streams connected to the leachate (ultra-twins with GMC-H cartridges, rubber gloves, rubber boots, field clothes).

Level D (rubber boots, field clothes, TLD badge, bring ultra-twins GMC-H) during site investigation of inactive parts of landfill. OVA or hNu taken to monitor active parts of landfill which consist of the dumping area and the 15 foot above-ground tank. Level C may be required.

Approved 12/9/81

[redacted] Section Chief

ECOLOGY AND ENVIRONMENT, INC.

FIELD INVESTIGATION PLAN - REGION 1

WORK PLAN INSTRUCTIONS

I. PERIMETER ESTABLISHMENT: Map/Sketch Attached c Site Control ___
Perimeter Indentified X Zone(s) of Contamination Identified X

NOTES: ___

c areas of special safety concern identified

II. PERSONAL CLOTHING:
Level of Protection: A ___ B ___ C X D X
Modifications: See page 1

Surveillance Equipment and Materials: TLD badge, OVA or hNu if ambient temperatures permit.

III. DECONTAMINATION PROCEDURES:
Hot Line Location (initial): N/A
Command Post Location (initial): N/A
PDS Stations: 1. boot and glove wash 2. boot and glove rinse
3. ___ 4. ___ 5. ___
Equipment and materials/Special Facilities:
E & E FIT personnel will shower as soon as possible after leaving the site

IV. SITE ENTRY PROCEDURES:
Team Size: E & E 3 State ___ Other ___
Entry Briefing (date) 12/13/81
Station Designation (name/responsibility): 1. Chris Hagger, Project Leader
2. Bill Norman, Safety 3. Keith Brown, Sampling
4. ___ 5. ___
6. ___ 7. ___
Work Schedule/Limitations: Entry to site per permission of Town of Holden

Notes: ___

WORK PLAN INSTRUCTIONS - continued

V. EMERGENCY PRECAUTIONS:

ACUTE EXPOSURE SYMPTOMS	FIRST AID
Volatile organic exposure: dizziness, lightheadness, nausea.	Get to fresh air. Provide O_2 if necessary. Seek medical assistance.
Frostbite, affected skin may appear flushed then change to a white or grayish-yellow color. Pain is sometimes felt but then subsides. Blisters may appear. The skin is pale and glossy and intensely cold and numb. Shock & unconciousness may result.	Warm the affected area immediately with extra clothing. DO NOT RUB Warm water may be used. Seek medical assistance.

HOSPITALS/POISON CONTROL CENTERS (address, telephone number)

See Resources List

EMERGENCY TRANSPORTATION SYSTEMS (Fire, police, ambulance)

See Resources List

EMERGENCY ROUTES

University of Massachusetts Medical School Hospital.
Route 12 South to Route 9 East, University of Massachusetts Medical Center is located along Lake Quinsigamond on Route 9 in Worcester.

EQUIPMENT CHECKOUT

SCBA	___	Cylinders	___	Eye Wash Unit	X
Ultratwin	X	Cartridges	GMC-H	First Aid Kit	X
Explosimeter			___	Drinking Water Supply	X
O_2 Indicator			___	Personal Clothing	X
Draeger Pump	___	Tubes	___	Decontamination Mat'ls	X
Radiation Survey Meter			X		
Radiation Contamination Meter			___		

DATE: 12/14/81 REV:

RESOURCES

(locate resources on area map)

	NAME	TOWN	PHONE	YES/NO
FIRE:	Holden, MA	Holden, MA	829-4411	no
POLICE:	Holden, MA	Holden, MA	829-3333	no
AMBULANCE:	Holden, MA Police	Holden, MA	829-3333	no
HOSPITAL ER	University of Mass. Medical Center, Worcester, MA		856-0011	no
WATER SUPPLY:	FIT will bring it with them			
TELEPHONE:	N/A			
RADIO COMMUNICATIONS:	N/A			
AIRPORT:	N/A			
HELIPORT AREA	N/A			
EXPLOSIVES UNIT:	Mass. State Police (Holden Area)		829-4431	no
EPA CONTACT:	Steve Mangion	EPA Region I Boston	223-5775	yes

LIST OTHER RESOURCES:

Allen Berg, Town Engineer, Holden Town Hall 829-6561

EMERGENCY NUMBERS

E & E, Inc., Woburn	(617) 935-0228	(0238) (4008)
E & E, Inc., Arlington, VA	(703) 522-6065	24 hr. number - call forwarding
Dr. Harbison - University of Arkansas	(501) 661-5766	
Dr. Harbison - after hours	(501) 370-8263	
Robert Young - home	(617) 545-4905	
Anne Marie Desmarais - home	(617) 897-5306	
Peter Bent Brigham, Occup. Ind. Health Clinic:		
Dr. Speizer, Dr. Shenker, Kay Jordan	(617) 732-5983	
24 hour number - ask for bellboy 904	(617) 732-6000	

ECOLOGY AND ENVIRONMENT, INC.

FIELD INVESTIGATION TEAM - REGION 1

SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Holden Landfill TDD NO: F1-8112-01

WSTS NO:

LOCATION: Holden, Massachusetts

PLAN PREPARED BY: Lori J. Fucarile

APPROVED BY: [signature] DATE: March 16, 1982 ✓

OBJECTIVE(S): To perform a land survey of ✓

the site.

PROPOSED DATE OF INVESTIGATION: March 17, 1982 - March 19, 1982 ✓

BACKGROUND REVIEW: Complete: X Preliminary: ____

DOCUMENTATION/SUMMARY: OVERALL HAZARD: Serious: ____ Moderate: ____

Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES(S): Liquid X Solid X Sludge X Gas ____

CHARACTERISTIC(S): Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic ____ Reactive ____ Unknown ____ Other (Name) ____

FACILITY DESCRIPTION: >80 acres landfill, a garage is on site. The Holden Landfill is an active municipal landfill.

Principal Disposal Method (type and location): Landfilling, an above ground tank is on site.

Unusual Features (dike integrity, power lines, terrain, etc) High voltage overhead power lines cross the site.

Status: (active, inactive, unknown) Active

History: (Worker or non-worker injury; complaints from public; previous agency action): Foul odors have been noted in the area of the leachate streams. Analysis of the leachate has indicated that the odor is not caused by priority pollutant volatile organics. The odor is most likely a result of decaying refuse.

C. HAZARD EVALUATION

Extremely low levels (< 17 ppb) of vinyl chloride and 1,1,1-trichloroethane were found in the leachate streams. However, because of foul odors noted in a previous E&E field investigation of the leachate streams, ultra twins will be worn while surveying the streams. Level D will be worn while surveying other areas of the site. The site is expected to be extremely muddy because of melting snow and thawing ground.

Level C	Level D
Rubber Boots	Rubber Boots (optional)
Rubber gloves (for decon)	TLD Badge
Ultra-twin w/GMC-H	Field Clothes
TLD Badge	
Field clothes	

D. SITE SAFETY WORK PLAN

PERIMETER ESTABLISHMENT: Map/Sketch Attached _____ Site Secured: _____

Perimeter identified? X Zone(s) of Contamination Identified? X

PERSONAL PROTECTION

Level of Protection: A _____ B _____ C X D X

Modification: Level C while surveying the leachate streams; Level D elsewhere on site

Surveillance Equipment and Materials: TLD badge

DECONTAMINATION PROCEDURES: Boot wash for boots contaminated by the leachate stream.

Special Equipment, Facilities, or Procedures: Plastic pail, brush, HTH, alconox, rubber gloves.

SITE ENTRY PROCEDURES: Entry to site per permission of Town of Holden.

Team Member	Responsibility
Chris Hagger	Project Leader/Safety
Or	
Keith Brown	Field Supervisor/Safety
Nonteam Personnel	
Moore Company	Surveyors

WORK LIMITATIONS (time of day, etc.):

INVESTIGATION DERIVED MATERIAL DISPOSAL: Washwater to be disposed of in leachate streams.

Site: Holden Landf[illegible] TDD #: F1-8112-01[illegible] Date: March 11, 1982

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance Holden, Massachusetts Police 829-3333

Hospital Emergency Room Univ. of Mass. Medical Center, Worcester, MA 856-0011

Poison Control Center N/A

Police Holden, Massachusetts 829-3333

Fire Department Holden, Massachusetts 829-4411

Airport N/A

Explosives Unit Massachusetts State Police (Holden Area) 829-4431

EPA Contact Steve Mangion, 223-5775

SITE RESOURCES

Water Supply Supplied by FIT

Telephone

Radio N/A

Other Allen Berg, Town Engineer, Holden Town Hall 829-6561

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (University of Arkansas) . . (501) 661-5766 or 661-5767
   (501) 370-8263 (24 hour)
2. Anne Marie Desmarais . . . . . (617) 897-5306
3. Robert Young . . . . . (617) 545-4905
4. FIT office . . . . . (617) 935-0228
5. Ecology and Environment, Inc. NPMO . . . . . (703) 522-6065
   (24 hour; call forwarding)
6. Regional Health Maintenance Program Contact . . (617) 732-5983
7. Brigham and Women's Hospital
   Dr. Speizer, Dr. Shenker, Kay Jordan . . . . . (617) 732-6000
   24 hour number ask for bellboy 904

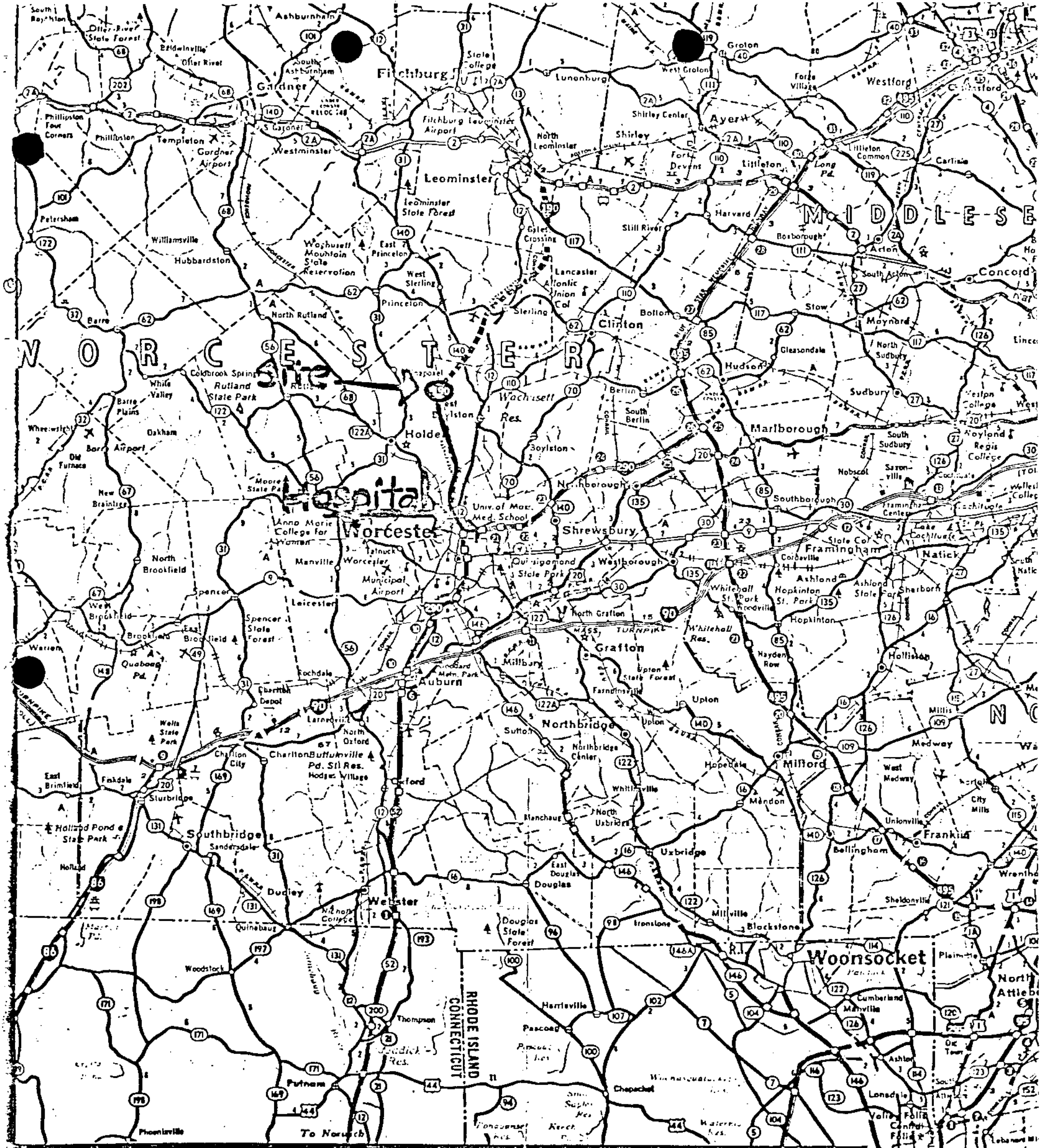
Site: Holden Landfi TDD #: F1-8112-01 Date: March 11, 1982

F. EMERGENCY ROUTES

(Give road or other directions; attach map)

HOSPITAL: University of Massachusetts Medical School Hospital Route 12 South to Route 9 East, University of Massachusetts Medical Center is located along Lake Quinsigamond on Route 9 in Worcester.

OTHER: Directions to site: Mass. Pike west to Auburn Exit, Rte 290 North to Rte 190 North.



HOLDEN, MA

F1-8112-01

gton L-4
ect K-7
n J-3
net L-6
s 6-2
nville D-2
am D-4
d A-4

Clarksburg B-2
Clayton A-4

recycled paper

Griswoldville D-2
Groton H-2

Mashpee M-6
Mattapoisett L-6

Pigeon Cove M-2
Pinehurst K-2

ecology and environment

Tewksbury K-2
Three Rivers E-4